Topic: Absorption of water by desert-adapted plants vs. non-desert adapted plants.

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Absorption of Water by Desert Adapted Versus Non-Desert Adapted Plants

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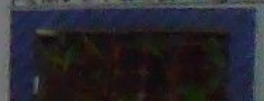
Picture of Plants Before Experiment



Purpose

The purpose of this experiment is to determine if desert adapted plants can absorb more water than non-desert adapted plants.

Investigative Question

Will desert adapted plants (tepary beans, dent corn), soak up more water (grams) than non-desert adapted plants (pinto beans, sweet corn) over a period of twenty-four hours?

Hypothesis

If I place desert adapted and non-desert adapted plants in a hydroponic set-up for twenty-four hours, then desert-adapted plants will be able to soak up more water than non-desert adapted plants.

Abstract

The title of the project is, "Absorption of Water by Desert Adapted Versus Non-Desert Adapted Plants." The Investigative question is, Will desert adapted plants be able to soak up more water than non-desert adapted plants over a period of twenty-four hours? My hypothesis is that desert adapted plants will soak up more than non-desert adapted plants. For this experiment, I tested desert-adapted dent corn and tepary beans, and non-desert adapted sweet corn and pinto beans. They were sprated and grown for eleven days. Then they were gently removed from soil, weighed, and suspended in water for twenty-four hours. They were weighed again and the average change was calculated. The average weight change for the tepary beans was -2.35%, while the pinto beans was 12.26%. The dent corn grew 15.065%, and sweet corn grew 6.0035%. The desert adapted corn was better than the non-desert adapted corn. However, the non-desert adapted bean was better than the desert-adapted bean. Therefore, my hypothesis did not work because there was no pattern on whether desert adapted plants absorb more water than non-desert adapted plants.

Absorption of Water by Desert Adapted Versus Non-Desert Adapted Plants

Independent Variable: The different types of plants selected for the experiment (tepary beans, pinto beans, dent corn, and sweet corn).

Dependent Variable: The amount of water each plant absorbed, measured in weight gain.

Constants: The ages of the plants, the sunlight and water supplied, the beaker size, the conditions during the experiment, and the duration of the experiment.

Materials being used

Tepary bean seeds, pinto bean seeds, dent corn seeds, sweet corn seeds, paper towels, plastic bag, compost, dirt, plant containers, water, ten glass beakers, chicken wire cage, two lamps, three buckets, two napkins.

Procedures

- Eight tepary beans, pinto beans, dent corn, and sweet corn seeds were placed in a wet paper towel, and were left for two days to germinate.
- The germinated seeds were planted in three planters, each with six containers, with a soil mixture of 50% dirt, and 50% compost. They were watered in.
- The plants were grown for thirteen days. Plants with at least one leaf were selected.
- The plants were popped out of the planter with soil into a water bucket. The soil was gently removed.
- The roots were sprayed clean and air dried for five minutes.
- The plants were weighed and put in beakers of 250 ml water, where they sat for twenty-four hours.
- The plants were removed from the water, and air-dried for another five minutes.
- The plants were weighed and compared to their previous weight.

further improve the experim

Picture of Plants Before Experiment

compared to their previous weight.

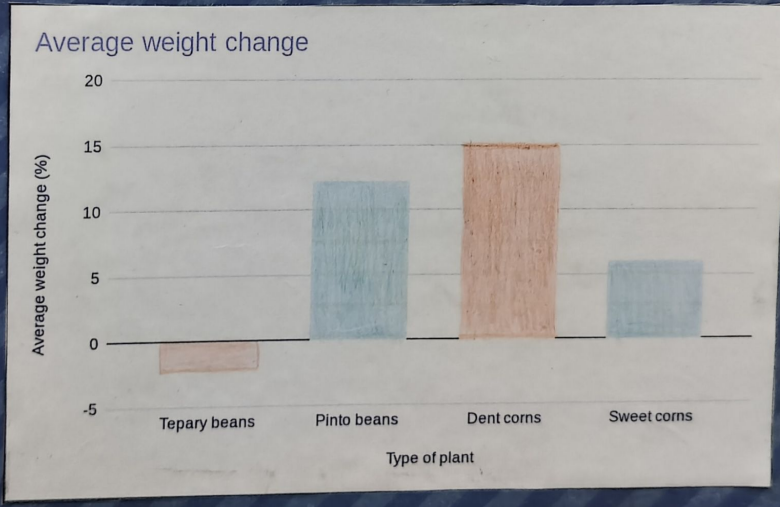
Table Showing Experiment Results

Type of Plant	Average percent weight change
Pinto Bean	12.26 %
Tepary bean	-2.35 %
Sweet corn	6.0725 %
ent corn	15.065 %

Picture of Experiment Set-up

Picture of Weighing Process

Graph Showing Experiment Results



Data Analysis

The desert adapted corn gained the most weight on average of all the plants. However, the desert adapted bean lost weight, and the average was lower than that of the non-desert adapted bean. There per did not appear to be a pattern on whether desert adapted plants absorbed more water than non-desert adapted plants.

Conclusion

My hypothesis did not work, because there was not a clear pattern
Only one type of desert adapted plant gained more than the non-desert adapted plan

Limitations

The Sample size for the beans was too small, so they would not be resistant to outliers. The tepary roots also appeared less developed It is possible they were handled less carefully, which may have led to damage of the roots.

Application

A greater sample size was needed for the beans. Additionally, the handling of the plants could have been done more gently, to reduce damage of the roots. There would

Research Summary

Desert plants live in environments where water is scarce, so they have adaptations that **maximize water absorption and reduce water loss**. They have properties like **deep or widespread root systems** to reach underground water or collect brief rainfall quickly, **thick, fleshy roots or stems** that store water (e.g., cactus) and **high root absorptivity**, allowing rapid uptake of water after rainfall. Also their leaves **may be small or no leaves** to reduce water loss and have a **waxy cuticle** that limits evaporation. On the other hand, Non-desert plants grow in environments where water is more regularly available. Their **characteristics are Shallow or moderate root systems, thin roots** designed for steady water absorption, **larger leaves** for photosynthesis and **less water storage capacity.**

A similar experiment is an experiment about the relationship between root size, yield, and water efficiency of Maize plants. The researchers were testing the absorption of maize, under both water-sufficient conditions and water-deficient conditions, with two different species of maize. What they found was that the small-rooted species had a higher yield and water absorption efficiency than the larger-root species. It didn't change under either of the different water conditions. Experts now know that small-rooted maize plants do better in all conditions. They also found that trimming the roots and reducing the root-shoot ratio increases the yield and water absorption, for the large-rooted species.

This experiment's effects on everyday life could help with water conservation. If desert-adapted plants soak up more water, when given the same amount as non-desert adapted plants, it would show that they are better and more efficient. Water is a precious resource, especially during droughts and in the desert, and if desert adapted plants make the most of the water that they are given, non-desert adapted plants may be planted less frequently. They need more water to thrive than desert-adapted plants, and if there aren't as many of them, the amount of water being used on them will decrease. This will save water that would have had to help those plants survive, and could help water-conservation all across the world.

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By: Daniel Drost

Take away:

I found out that sweet corn is not desert adapted, and if in a drought, the corn will suffer from having less yield, lower kernel quality, and will affect the flavor of the ears. Therefore, sweet corn is not desert-adapted, and so I can use it for a non-desert adapted plant.

Work Cited Source 2

Growing food in the Face of a Hotter, Drier Climate

https://www.chelseagreen.com/2025/growing-food-global-warming/?srsltid=AfmBOopC67ViPRnabIxhvLpBC2l80lf5jkaFOfV4Uqr7jHjt8GqnigT7https://www.chelseagreen.com/2025/growing-food-global-warming/?

By

https://www.chelseagreen.com/2025/growing-food-global (no individual author cited)

Take away:

I was able to learn that even though tepary beans and pinto beans are related and both beans, tepary beans are desert-adapted, while pinto beans are not, so I can use tepary beans for my desert-adapted plant, and pinto beans as my non-desert adapted plant.

Scientific vocabulary and definitions

1. Adapted: Suited by nature, character, or design to a particular use, purpose, or situation, used with to or for.
2. Desert: a region so arid because of little rainfall that it supports only sparse and widely spaced vegetation or no vegetation at all.
3. Absorption: To take in or soak up a substance.
4. Drought: A prolonged dry period in the natural climate cycle that can occur anywhere in the world.