

A. Question or Problem being addressed

Comparing various photosynthetic pathways in order to maximize crop yield in varying water level conditions.

B. Goals/Expected Outcomes/Hypotheses

Due to Purslane being a unique organism that has both C₄ and CAM working in tandem, it would yield the greatest crop growth in comparison to Sorghum and Orchids which have C₄ and CAM photosynthesis respectively. This result would be consistent for all 3 water levels.

C. Description in detail of method or procedures

(The following are important and key items that should be included when formulating ANY AND ALL research plans.)

- Procedures: Detail all procedures and experimental design to be used for data collection
 - Data Analysis: Describe the procedures you will use to analyze the data/results that answer research questions or hypotheses
1. Set up 18 biodegradable cups with 300 grams of potting soil in each one
 2. Label one cup as "Sorghum-C4", another cup as "Purslane-C4 & CAM", and the final cup as "Orchids-CAM"
 3. Create 3 sets of these cups and the cups in each set must be labelled "low water", "medium water", and "high water"
 - a. Ensure that there are three cups labelled low water, three cups labelled medium water, and three cups labelled high water

Set 1

[S _L]	[P _L]	[O _L]
[S _M]	[P _M]	[O _M]
[S _H]	[P _H]	[O _H]

b.

c. Set up should look like this

- i. S stands for "Sorghum-C4"
- ii. P stands for "Purslane-C4 & CAM"

- iii. O stands for “Orchids-CAM”
 - iv. L stands for “low water”
 - v. M stands for “medium water”
 - vi. H stands for “high water”
4. Create divots in the soil that are 0.5” deep and place a sorghum seed inside the cup labeled “Sorghum-C4” for the set that is labeled low water. Seeds must be 4” apart
 5. Cover with soil upon placing
 6. Repeat steps 4 and 5 for the other two plants in their respective cups
 7. Repeat steps 4-6 for both medium and high water groups
 8. Let plants be able to have access to natural sunlight by being near a window sill or placing an artificial light source nearby for approximately 8 hours
 9. Set of low water plants will get 15 mL once a day. Medium plants will get 15 mL of water twice every day. High water plants will get 15 mL of water three times a day.
 10. Record observations in regards to height, initial mass, new mass, leave color and state, and other important information every Friday

Over time, the change in height will be observed for every plant in every category. Between each water level category, the heights and rate of height change will be analyzed and checked for which one presents the higher rate of growth and overall growth in low, medium, and high water levels.

Materials

- Purslane seeds (C₄ & CAM)
- Sorghum seeds (C₄)
- Orchid seeds (CAM)
- Water
- Biodegradable cups
- [Potting soil](#)
- [fertilizer](#)
- Artificial light source

D. Bibliography: List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

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