CARBON REDUCTION THROUGH PLANT MODIFICATION

Alexander Orlove & Alyssa Kimura

Chapman University Grand Challenges Initiative

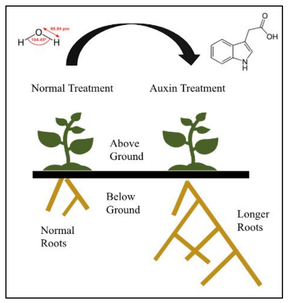
ABSTRACT

As climate change warms the California region during the summer as a result of the greenhouse gas effect, forest fires have become more frequent with each passing year. If atmospheric carbon dioxide could be reduced, so could the rate at which global warming occurs. Fertilizers rich in nitrogen and phosphorous could be used to keep plants more hearty, but they present the risk of algal blooms. If a non-nitrogenous fertilizer was implemented to ensure plants grew with adventitious root systems to harness a great amount of carbon dioxide and retaining moisture, the effect of wildfire spread on California's forests would be diminished significantly.

California Forest Fires

Final Plant Analysis

INTRODUCTION



Auxin-mediated Roots prior to analysis

Auxin is responsible for several responses in plants, but its effects on geotropisms were analyzed in this study. Auxins are naturally expressed in the apical shoots of plant roots, and play a vital role in signaling for downward growth. Additionally, this technique of using a natural fertilizer could have crucial implications on agriculture in terms of reducing the effect of carbon emissions from farming. It was hypothesized that the external input of auxin would **promote the growth** of more adventitious root systems in contrast to those treated with water alone.

E. Vesicaria Cleaned plant

METHODOLOGY

Seeds were placed in trays of soil and put in growth chambers

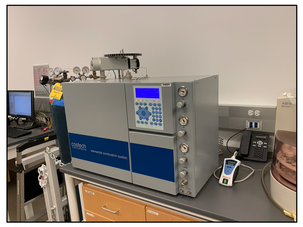
Humidity, temperature, light intensity kept constant

One tray watered with auxin+water, one tray watered with tap water (500mL each)

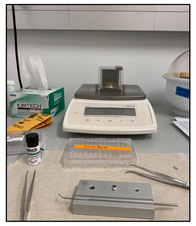
Plants removed from soil, rinsed, cut roots off of above ground mass of the plant. Roots were dried in oven

Plants massed, measured using imageJ and flatbed scanner, volume

Heated plants in oven, ground with a mortar and pestle, placed in elemental analyzer



Elemental Analyzer



Finding relative root mass

RESULTS

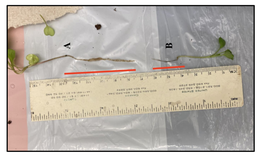


Figure 1 and 2. Comparative analysis of apical length of auxin versus water-mediated roots.
A=Auxin, B=Water

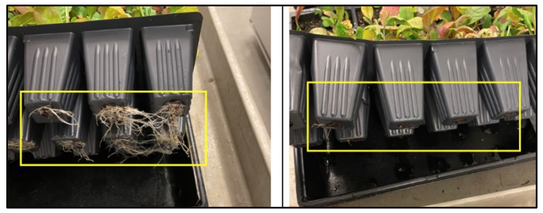
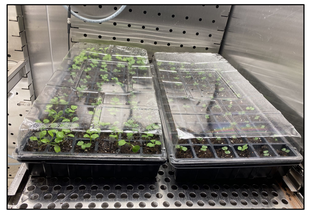


Figure 3. Comparative analysis of auxin versus water-mediated root spread.
Auxin (left), water (right)

RESULTS

Figure 4. Visual comparison of above-ground plant mass after 4 weeks of growth.
In both images, Auxin (left), water (right)



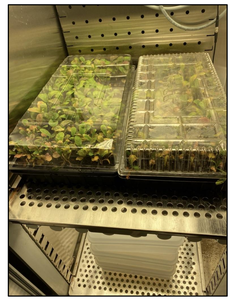
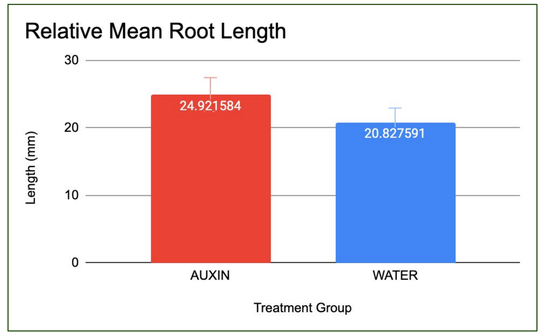
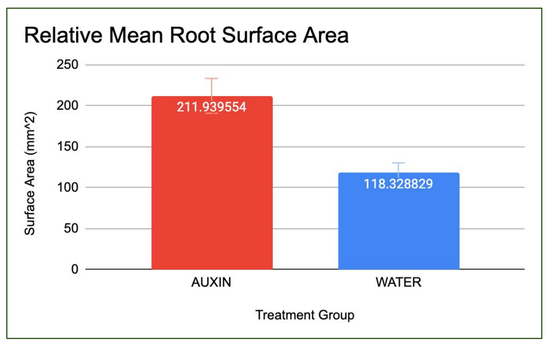


Figure 5. Comparison of the mean values determined by measurements collected for auxin and water-mediated plants roots.

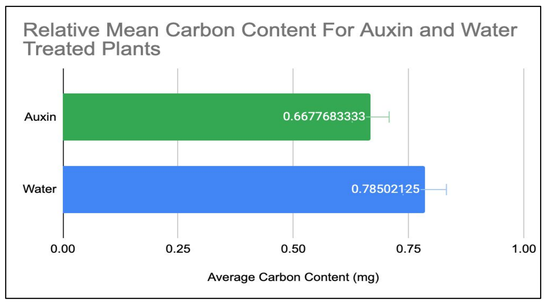
5a.



5b.



5c.

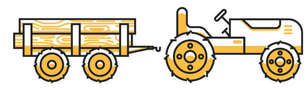


CONCLUSION

In all trials, auxin mediated plant roots revealed larger measurements relative to water-mediated plant roots. All values collected, when comparing means, had P values of less than 0.05, indicating their significance (mass p = 0.00216, length p = 0.0335, surface area p= 0.00895). On average, auxin-treated plants expressed apical root growth 2.13 times as large as water mediated plants in trial II, and approximately 1.11 times as large in trial I. The potential storage area for carbon dioxide is likely inherently larger in roots that exemplify more mass (e.g. the auxin-treated roots).

IMPLICATIONS

Based on this study, data supports the claim that **auxin increases the growth of plant roots** and has the potential to store more carbon than an average tap-watered plant would. This can be an invaluable tool to combat climate change since plants absorb carbon dioxide which is a greenhouse gas that can be stored in the atmosphere for over 300 years. Auxin excellerates the development of roots and its tendency to do so makes it a great fertilizer replacement for agricultural purposes.



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NEXT STEPS

Further research in the scope of this study will consist of testing different concentrations of auxin to determine maximum efficacy–to yield large roots, along with trying this experiment with other plants.

REFERENCES

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