Quantitative Analysis of growth in Wisconsin Fast Plants Under Varying pH Levels

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Introduction

The Wisconsin Fast plant (*Brassica rapa* ssp. *oleifera)* is a mustard plant with a life cycle of approximately 40 days from planting. It is this short life cycle, coupled with easily quantifiable characteristics, that make the Wisconsin Fast Plants ideal for laboratory conditions.

Over the course of three weeks our Fast plants were treated with water solutions of varying pH levels, in order to effectively determine how a common plant would react to acidic and basic environments. It is important to understand how acid solutions affect growth and yield so that today's industrialized agricultural complex can prevent and combat threats such as acid rain.

Materials and Methods

- Forty wisconsin fast plants were used in this experiment. They were treated with plain water for the first week, and the next two weeks they were treated with their assigned pH level treatment.
- The first 10 plants were treated with water with a pH level of 7.
- The second group of 10 plants were treated with a treatment of sulfuric acid and water to reach a pH level of 3.
- The third group of 10 plants were treated with a treatment of sulfuric acid and water to reach a pH level of 5.
- The fourth group of 10 plants were treated with a treatment of sodium hydroxide and water to reach a pH level of 9.

Results

Below the tables show our weekly data for each pH level in 3 different categories. Our data was shown to be significant for the bud count on week 3(Figure A) and for the leaf count on week 2(Figure C). However, we did not detect any important trends regarding the various pH levels.

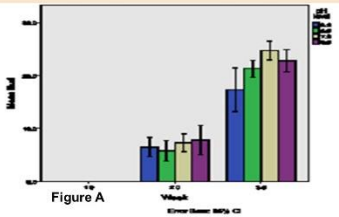

Figure A: *Shows the amount of Buds per week per pH level.*

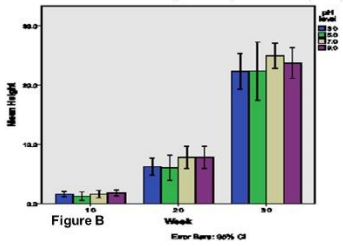

Figure B: *Shows the height in centimeters per week per pH level.*

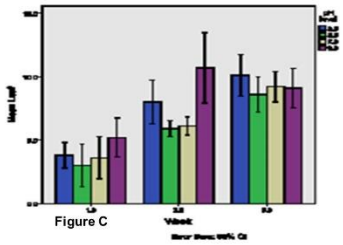

Figure C: *Shows the number leafs per week per pH level.*

Discussion

Unfortunately we did not find enough significant data to be able to see if our hypothesis was correct or not. The experiment could be conducted better by using more treatment for a longer period of time to see if more significant results show. For bud count, it seemed as though in week 3 the neutral pH served as the best solution. For the leaf count, in week 2 the two extreme solutions seemed to work best only for it to even back out by week 3. The height for each pH level seemed ,for the most part, constant. However, this is all quantitative data. When observing the plants, we noticed that some of the leaves that were treated with pH 3 had burn spots on the leaves. Seeing this, you might need to consider more than just quantitative data to determine how the pH level affected the plants.

Conclusion

It is clear that varying levels of acidity have some affect on the plant. These effects are not limited to growth and yield as our data suggests, but could be more qualitative. Future experiments should consider growth angle and chlorophyll content as dependent variables. These measurements would yield more statistically significant findings.

References

- Böhlenius, H., Övergaard, R., & Asp, H. (2016). Growth response of hybrid aspen (Populus × wettsteinii) and Populus trichocarpa to different pH levels and nutrient availabilities. *Canadian Journal Of Forest Research*, *46*(11), 1367-1374.
- Bailey, Christine., Larson. D. W. (1982) Water quality and pH effects on Umbilicaria mammulata(ach.)Tuck. *The Bryologist.* 85 (*4*). pp. 431-437
- Adaros, G., Jager, H. J., Weigel. H. J. (1998). Affect of sulphur Dixoide and acid rain or in combination on growth and yield of broad bean plants. *The new phytologist.* 108(*1).* pp. 67-74
- Environment Protection Agency. (2016). Effects of acid rain.