

Contrasting analysis of monocot and dicot growth with varying glyphosate application

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Introduction

Glyphosate, a key ingredient in many herbicides, has become widely incorporated into today's agricultural practices. (Kishore 1992) The run off and spreading of this chemical on to non target species has become a hot topic of debate in today's agricultural circles as usage of the chemical continues to increase. (Huber 2011). It has been suggested that this could have some adverse effects on non target crops even in minute concentrations. (Davis 2013). Our null hypothesis is that there will be no significant difference in growth when different concentrations of glyphosate are applied to each set of plants. We hypothesized that there would be a significant difference between the growth in each set of plants based on the concentration of glyphosate that was applied.

Materials and Methods

- This experiment was conducted over a three week period in a controlled environment where temperature and light remained consistent.
- We had 216 plants that were divided into four groups per species.
- The four groups consisted of a control group that incurred 0.0 glyphosate application, a 0.1 glyphosate concentration group, a 0.01 glyphosate concentration group, and a 0.001 glyphosate concentration group, allotting 27 plants in each group planted into small black pots. (Figure A.)
- We monitored water levels daily and watered when necessary.
- We measured shoot height weeks 2, 3, and 4 using a ruler and recording our data onto an excel spreadsheet.
- During harvest in week 4, we measured shoot biomass of each plant and analyzed the data using SPSS and ANOVA.

Figure 1: Wheat Biomass per Treatment

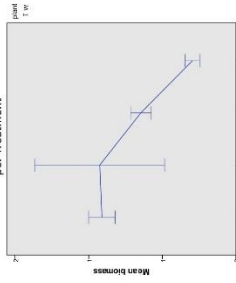


Figure 2: Glyphosate effectiveness on Wheat

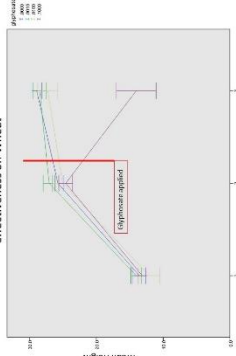


Figure 3: Wisconsin Fast Plant Biomass per Treatment

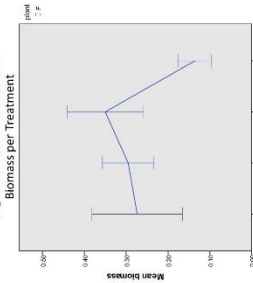


Figure 4: Glyphosate effectiveness on Wisconsin Fast Plant

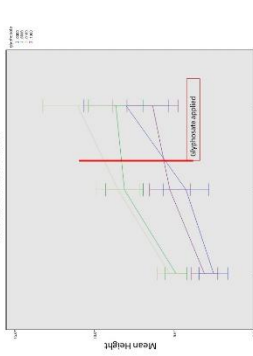


Figure 1: Mean biomass for Wheat was lowest when glyphosate concentration was highest.

Figure 2: Drastic decrease in height when the highest concentration of glyphosate was applied.

Figure 3: The lowest mean biomass of the Wisconsin Fast Plant was seen with the height concentration of glyphosate applied.

Figure 4: The growth of the Wisconsin Fast Plant decreased heavily after the application of glyphosate.

Figure A.



Figure A. All plants one week post seed germination.

Figure B.



Figure B. Wheat plant two days prior to glyphosate application. Figure C. Wheat plant five days post glyphosate application. Figure D. Wisconsin Fast Plant two days prior to glyphosate application. Figure E. Wisconsin Fast Plant five days post glyphosate application.

Figure C.



Figure D.



Figure E.



Results

The 0.1 concentrate in both the monocot wheat and dicot Wisconsin Fast Plant were the most heavily affected by the glyphosate application. The plants with smaller concentrations of glyphosate applied were affected as well in varying degrees based upon their application concentration. The p-value for glyphosate concentrations applied to both species of plants was 1.679E-05; With ANOVA the data p-value was determined to be significant being less than 0.05.

Conclusion

We rejected our null hypothesis and provided evidence that there is a significant affect on plants that are exposed to even an extremely diluted concentration of glyphosate. Some of the variance in the data can be explained by the abnormal growth of some individuals at the beginning of data collection. Though there were skewed results in the first data set, moving forward the data showed a more consistent rate of growth. This demonstrated the effect of glyphosate not only on the dicot but also on the monocot that was exposed to the agent. Our results provide further evidence that even trace amounts of glyphosate on non target plants can have an effect. Certain means of data could be skewed due to a lack of growth in select individuals of each species. This topic could be further researched by finding what concentrations of glyphosate most types of plants are negatively affected by and then altering the concentrations accordingly. Research could also be done to determine what kind of effect the chemical has on animals that may come into contact with it.

References

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Acknowledgments

We would like to thank Dr. Andrew Doust, William Hammond, and Ky Shen for their patience and assistance with this project.

