Commercial vs. Wild Mycorrhizae Effects on Biomass in Grass Species

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Introduction

Background:

- Mycorrhizae are very important in many different environments, including prairies ecosystems, agriculture and others throughout the globe.
- Whether realized or not, people are influenced by the effects of mycorrhizae on plants in some way throughout their lifetime. This can be through miniscule things such as eating a meal for lunch, you could have eaten a plant that had been effected by mycorrhizae or used it in the cooking process.
- Mycorrhizae has a symbiotic relationship with plants, meaning that they both benefit each other. Mycorrhizae attaches to the roots to benefit the plant by creating more surface area for the roots for water and nutrient uptake (Huang et. al., 1985).
- Since mycorrhizae allows for more water and nutrient uptake for the plant, it causes more growth and a higher rate of photosynthesis (Evans, 2001).
- There is a lack of information about different grasses and how they are affected by mycorrhizae in two different forms, wild mycorrhizae and commercially engineered mycorrhizae.
- Exotic species can be a problem in certain environments, being invasive and taking over areas where native species have always thrived, causing the native species not to have room to grow.
- Native plants with mycorrhizae from the same region will have an evolutionary relationship with one another, causing them to have a more beneficial relationship when they grow together (Rua et. al., 2016).
- Our central research question is whether commercial or wild mycorrhizae would be more beneficial specifically in increasing plant biomass in a native grass species *Elymus Canadensis,* vs an exotic grass species, *Bromus inermis*. We measured photosynthesis (measured as chlorophyll content), biomass, and stem height in response to treatment with commercial and naturally-occurring mycorrhizae.

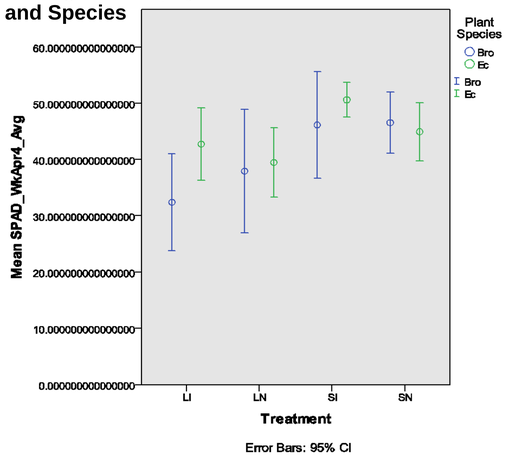
Hypotheses:

- We hypothesized that wild mycorrhizae would be more beneficial in general, especially on native plants, since plants and mycorrhizae from the same region should have evolved together. This we call our “Mother Nature Hypothesis” since we believe natural processes can do a better job at sustaining plant life than humans can.
- We predicted that the wild mycorrhizae would increase the plant’s shoot and root biomass, and increase the height and chlorophyll content of our two species of grasses, but that wild mycorrhizae would benefit the native grass species more than the introduced grass species.

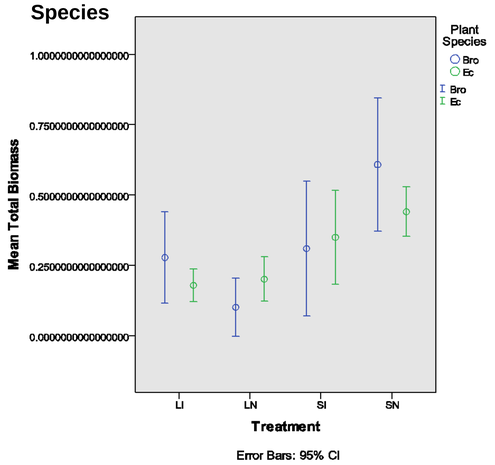
Methods

- We worked with two grass species: *Bromus inermis,* an introduced species, and *Elymus canadensis,* a native species.
- To test the effects of wild and commercial mycorrhizae on biomass, chlorophyll content, and stem height, we divided the plants to be with four different soil treatments, Live Inoculated (LI), Live Non-Inoculated (LN), Sterile Inoculated (SI) and Sterile Non-Inoculated (SN).
  - 48 plants were used in total.
  - There were 6 plants of each species for each treatment.
  - We measured each variable by using a SPAD meter for chlorophyll, a ruler for stem height, and a balance for biomass.
- We collected data on the height and chlorophyll content of each species once a week for 3 weeks and the dried root and shoot biomass of each plant at the end of our experiment.
- Using a two-way ANOVA test and the SPSS program, we configured our data to find the statistics on our differing variables of biomass, stem height and chlorophyll content to see if any were significant.

Average Chlorophyll Content Between Treatments and Species



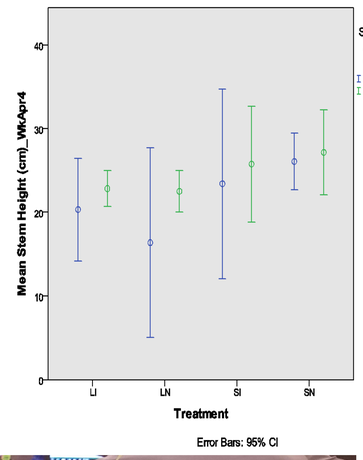
Total Biomass Between Treatments and Species



Statistics From Two-Way ANOVA Test

Trait	F statistic	Overall Treatment Effect	Live vs. Sterilized	Inoculate vs. No inoculate	Sterilization-Inoculate interaction
Biomass	6.986	P= 0.000	P= 0.000	P= 0.180	P= 0.460
Stem Height	1.708	P= 0.136	P= 0.006	P= 0.977	P= 0.466
Chlorophyll Content	5.057	P= 0.001	P= 0.000	P= 0.682	P= 0.221

To the right: Average Stem Heights Between Treatments and Species



Below: The two species of grasses, *Bromus inermis* and *Elymus Canadensis* growing in the different soil treatments

Results

- The plants in both of the Sterile (S) groups, especially Non-inoculated (N), had larger total biomass than the Live Inoculated and Live Non-Inoculated groups.
- Both species in the Sterile Inoculated (SI) group had higher chlorophyll content.
- Both grass species had longer stem height from the SI and SN treatments than LI and LN treatments.
- A two-way ANOVA test showed a statistically significant effect overall of treatments in biomass and chlorophyll content (p=0.000) and (p=0.001) respectively, but not for stem height (p=0.136).
- Specifically, there was a significant effect of Live vs. Sterilized treatment on biomass (p=0.000), chlorophyll content (p=0.000) and stem height (0.006).

Discussion and Conclusion

In doing this experiment to find the effects of commercial vs. wild mycorrhizae on biomass in two grass species, *Bromus inermis* and *Elymus Canadensis*, we hypothesized that the wild mycorrhizae would be more beneficial in general, especially on native plants, since plants and mycorrhizae from the same region should have evolved together. We predicted that the wild mycorrhizae would increase the plant’s shoot and root biomass, and increase the height and chlorophyll content of the two species, but that wild mycorrhizae would benefit the native grass species more than the introduced grass species. We found that our hypothesis was not supported. The results showed that both species had a larger biomass, higher chlorophyll content and longer stems in both of the Sterile treatments. This means that the Live groups, or wild mycorrhizae, did not produce better growth than commercial mycorrhizae. There was not much evidence to say that the commercial mycorrhizae produced better growth than the wild mycorrhizae either, being that the better growth, biomass and chlorophyll content was found in both sterile treatments. The live treatment groups were slightly below the sterile treatments in all three traits. There was most likely no significance in the stem height overall due to the fact that the duration of the experiment was rather short, and grasses grow at a similar rate. The sterile soil showed the best growth and that is most likely because it was a “clean slate of soil,” so to speak, for the plants to grow in as best they could, with no other factors other than the inoculate.

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