# Mycorrhizae: Native vs Commercial

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## Introduction

- Mycorrhizal fungi are a key contributor in the growth and reproduction of plants. It has been said that mycorrhizal fungi are vital components of nearly of nearly all terrestrial ecosystems (Smith et al 2003).
- Mycorrhizal fungi have the known effect of increasing nutrient uptake and tolerance to environmental stresses. This increase in nutrient uptake generally leads to an increase in biomass (Jansa et al 2008).
- The symbiosis between plants and mycorrhizal fungi can prove to be the key in increasing plant growth without synthetic fertilizers (Ryan and Graham 2002).
- With an ample amount of mycorrhizal fungi the reproduction and growth of plants can be dramatically improved. The understanding of which mycorrhizal fungi, native or commercial, is better for plants to increase growth or have adequate reproduction is still uncertain. However, the Rua meta-analysis leans towards a native form of mycorrhizae for maximizing growth potential.
- In our research, we have differentiated between the plants inoculated with native mycorrhizal fungi and plants inoculated with commercial mycorrhizae, planted in both sterile and natural soil, in order to accurately measure the results.
- **We hypothesize that commercial mycorrhizae, inoculated in sterile soil, will produce larger height and larger stem diameters than naturally occurring mycorrhizae.**

## Methods

- We tested 2 different types of warm season C4 grasses, *Bothriocloa ischaemum (Bot)* and *Andropogon gerardii (Ag)*, planted in living prairie soil, which contains native mycorrhizae, and ones planted in sterile soil. Half of the sterile soil plants and the living prairie soil plants were inoculated with commercial mycorrhizae and the other half were not. This was done in order to analyze growth rates of stem diameters and overall height.
- We tested the two species with 24 plants per species, that's 48 total plants with 4 treatment levels and 6 replicates.
    - (LI) Commercial mycorrhizal inoculum present, non-sterilized prairie soil
    - (SI) Commercial mycorrhizal inoculum present, sterilized prairie soil
    - (LN) Commercial mycorrhizal inoculum absent, non-sterilized prairie soil
    - (SN) Commercial mycorrhizal inoculum absent, sterilized prairie soil
- We used Extreme Gardening Mykos commercial mycorrhizae inoculum and *Rhizophagus irregularis* natural inoculum.
- During the testing, we recorded stem diameter and height for all plants once a week.
- At the end of the testing, we took the plants out of their pots and measured them for dry weight, also produced an ANOVA table in SPSS for analysis.

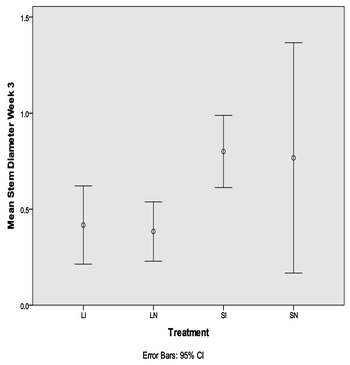


Figure 1: Mean stem diameter for *Andropogon gerardii.*

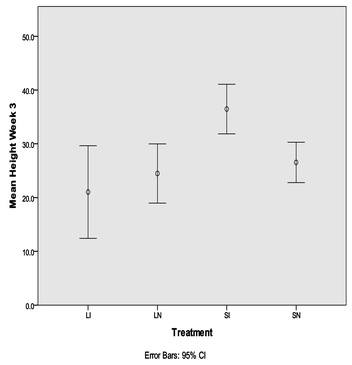


Figure 2: Mean stem height for *Andropogon gerardii.*

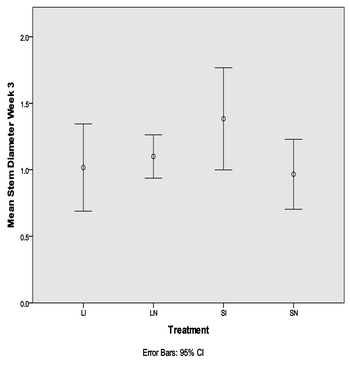


Figure 3: Mean stem diameter for *Bothriocloa ischaemum*.

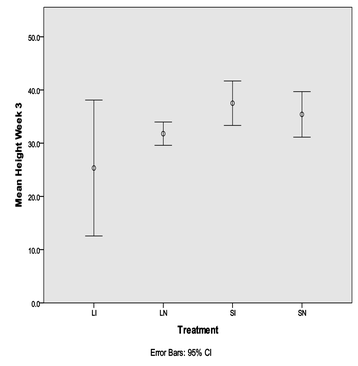


Figure 4: Mean height diameter for *Bothriocloa ischaemum*.

## Literature Cited

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Smith, S.E., and I. Jakobsen. 2003. Mycorrhizal Fungi Can Dominate Phosphate Supply to Plants Irrespective of Growth Responses. *Plant Physiology* 133: 16–20.

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## Results

- Figure 1: Stem diameter/Ag
    - Soil treatment: F=8.437, P=.009
    - Inoculum treatment: F=.064, P=8.03
- Figure 2: Stem height/Ag
    - Soil treatment: F=14.500, P=.001
    - Inoculum treatment: F=1.980, P=.175
- Figure 3: Stem diameter/Bot
    - Soil treatment: F=1.027, P=.323
    - Inoculum treatment: F=2.096, P=1.63
- Figure 4: Stem height/Bot
    - Soil treatment: F=8.133, P=.010
    - Inoculum treatment: F=.615, P=.442
- Aboveground Biomass
    - Soil Treatment: F=34.747, P=.000
    - Inoculum Treatment: F=.570, P=.455
- Belowground Biomass
    - Soil treatment: F=19.401, P=.000
    - Inoculum treatment: F=.080, P=.779

**Soil treatments produced a high amount of significance in all measured variables with the exception of figure 3, stem diameter/Bot. All of the inoculum treatments produced no significance.**

## Conclusion

- Through this experiment, we set out to determine how well commercial mycorrhizae inoculum compared to natural mycorrhizae inoculum. We based our hypothesis on previous research done by others and their results. Such as the Rua et al meta-analysis and the Hoeksema meta-analysis. Rua and Hoeksema showed us that we could expect to see a positive symbiosis between mycorrhizae and our tested plant species (Rua et al 2016), (Hoeksema et al 2010). Another study preformed by H.I. Rowe allowed us to accurately interpret the status of native mycorrhizae and its effects on plants (Rowe et al 2007).
- **The results of this experiment proved our hypothesis to be correct.**
- **The mean stem heights and diameters of both the Ag and Bot species were both larger when sterile soil was inoculated with commercial mycorrhizae as compared to naturally occurring mycorrhizae.**
- **Mean stem diameter**
    - **Ag SI 0.7cm Ag SN 0.6cm Bot SI 1.4cm Bot SN 0.9cm**
    - **Ag LI 0.4cm Ag LN 0.3cm Bot LI 1.0cm Bot LN 1.1cm**
- **Mean height**
    - **Ag SI 38cm Ag SN 28cm Bot SI 39cm Bot SN 37cm**
    - **Ag LI 22cm Ag LN 25cm Bot LI 26cm Bot LN 32cm**
- These results show that commercial mycorrhizae is clearly beneficial to these plant species in sterile soil. However, it should be noted that mixing commercial mycorrhizae and naturally occurring mycorrhizae produced shorter heights and smaller stem diameters in both spices when compared to just natural mycorrhizae in the living prairie soil.
- **In conclusion, we have determined that commercial mycorrhizae, used in the proper soil, can exceed the growth rates of the same plants using natural mycorrhizae.**

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