Plant growth response to wild and commercial mycorrhizae

Lexie Havens, Rosalynd Hilliard, Matthew Frantz, Dyllon Cooper

Department of Plant Biology, Ecology, and Evolution, Oklahoma State University, Stillwater, OK

Introduction

- Arbuscular mycorrhizal (AM) fungi is a commonly found fungi that lives in a mutual symbiotic relationship with a majority of plants(Bennett and Beaver, 2007).
- AM can have an influence on the rate of plant growth due to the ability of AM fungi absorbing nutrient from the soil, especially limiting nutrients like phosphorus or nitrogen, transferring it to the roots of its host plant and aid in the overall health and development of the plant.
- By increasing the resistance to pathogen attacks within the plant, mycorrhizae prevent the likelihood of being outcompeted by other fungi, bacteria or airborne viruses(Artursson et. al, 2005).
- In annual crops, like sunflowers, mycorrhizae can cause an increase of chromium which increase the overall plant mass and the rate of gas exchange (Daves and Puryear, 2007).
- We hypothesize that the plants being treated with both commercial mycorrhizae and wild mycorrhizae will have a higher biomass

Methods

- To carry out our research we set up four treatment groups, with six pots per group, for the two plant species, Ha, *Helianthus annuu*, and Rc, *Ratibida columnifera*, that were randomly selected for us.
- For the first treatment group, Root Naturally Endo Mycorrhizae commercial inoculum was absent in sterilized prairie soil (SN)
- For the second treatment group, commercial mycorrhizal inoculum present, sterilized prairie soil (SI), a small hole was formed in the soil and a teaspoon of inoculum was added into the soil after the plant was transferred.
- The previous steps were repeated for remaining treatment groups, unsterilized soil without inoculum (LN) and unsterilized soil with inoculum (LI)
- The plant were watered as needed
- Every week after transplanting we measured the height of each plant and if the plants survived.
- At the end of week four, we removed plants carefully from the soil, dehydrated them and weighed them to get the above and below ground dry biomass

Results

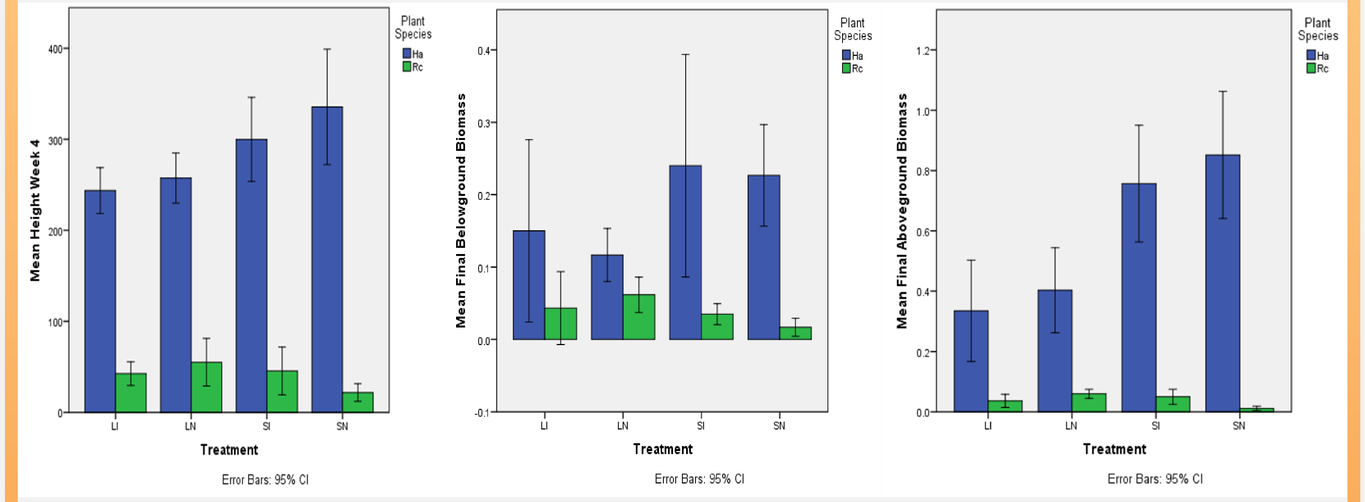

Figure 1. (Left) The average height of all four treatment groups for both species used during testing at week four with error bars representing the 95% confidence intervals of each mean. There are four different treatment groups, LI being the live inoculated soil, LN being the live non-inoculated soil, SI being the sterile inoculated soil, and SN being the sterile non-inoculated soil. There are two different species, Ha being *Helianthus annuu*, and Rc being *Ratibida columnifera*. There was significant difference ($p < 0.05$) in the mean heights of the different soil types as well as difference in means plant height for the different plant species interacting with varying soil treatments. Figure 2. (Middle) The average below-ground biomass of all four treatment groups for both species used during testing after being dried with error bars representing the 95% confidence intervals of each mean. There was significant difference ($p < 0.05$) in the mean below ground biomass for the plants species interacting with varying soil treatments. Figure 3. (Right) The average above-ground biomass of all four treatment groups for both species used during testing after being dried with error bars representing the 95% confidence intervals of each mean. There was significant difference ($p < 0.05$) in the mean above-ground of the different soil types as well as difference in mean above-ground biomass for the different plant species interacting with varying soil treatments.

The images below show one plant from each treatment group after harvesting. On the left is *Helianthus annuu*, and on the right is *Ratibida columnifera.* After transplanting all samples we then will place plant tags corresponding to each plant in the pots. Each treatment group has its own colored tag. The live inoculated soil has blue tags, the sterile inoculated soil has purple tags, the live non-inoculated soil has green tags, and the sterile non-inoculated soil has white tags.

Discussion

Our results show no significant difference between the plants treated with the commercial inocula, but the results do show that the soil type affected the growth of both species in some way. *Helianthus annuu* grew more in the sterile soil while *Ratibida columnifera* seemed to be most successful in the live soil. These results do not support our hypothesis since there was no significant growth difference as result of the commercial inocula. We cannot say with certainty that the difference in growth in response to soil treatment was caused by AM already present in the soil, but we can say that *Helianthus annuu* was most successful when all the organisms originally in the soil were removed. This finding directly contradicts the findings of Daves and Puryear (2007), since they found that mycorrhizae can cause an increase in mass of annual plants due to increased chromium uptake. Further studies should be conducted to determine the reasoning behind *Ratibida columnifera* increased growth in live soil. These studies should measure root colonization after growth in the live soil to determine whether or not AM fungi were present in the soil. According to our findings, we would not recommend the use of commercial inocula because there is no significant difference of growth between the inoculated and uninoculated soils.

Literature Cited

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