Fungi Fun: the Effects of Commercial Mycorrhizae on the Growth of *Desmodium canadense* and *Salvia azurea*

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Introduction

Background

Arbuscular Mycorrhizal Fungi (AMF) has long been established as an important contributor to the health and efficiency of native plant life. AMF forms mutual relationships with 80% of land plants (1). This is considered a symbiotic relationship, meaning both organisms gain from the interaction. The fungi gain carbon and the plants obtain more surface area, which allows for an increased uptake of water and nutrients (2). **Studies by (3) have shown that plant biomass can be positively affected by commercial AMF**. With this information being known, we conducted an experiment to observe the interaction of native AMF with plants in conjunction with commercial mycorrhizal fungi.

In an effort to better understand the symbiotic relationships with native plant species and AMF, we studied 2 plant species, *Desmodium canadense* and *Salvia azurea*. **We were interested in the effects of commercially available AMF on plant biomass, how commercial AMF compares with native AMF with their effect on plant biomass, and if commercial and native AMF interact to influence plant biomass**. We also observed the effects of combined arbuscular mycorrhizal fungi and commercial mycorrhizal fungi on chlorophyll content, determined by using a SPAD meter and plant growth, determined by measuring shoot length. Chlorophyll content enhances when plants are in conjunction with mycorrhizal fungi (4). According to (5), the largest biomass effect was recorded with non-N-fixing forbs, woody plants, and C4 grasses. This study also found that plants that are colonized by AMF grow about 3 times larger than plants that are not colonized by AMF. Due to a variety of factors, such as human agriculture, soils may become deficient of natural AMF therefore subsequent production often decreases as a result (6). Commercial mycorrhizal fungi could potentially be the solution in the loss of natural AMF in soils.

Hypothesis

We hypothesize that the commercially available AMF, when used in conjunction with native AMF will produce plants with longer shoot lengths, higher chlorophyll content and larger biomass.

Methods

- Species *Desmodium canadense* and *Savlia azurea* acquired at seedling stage.
- Transferred to conetainers in either living field soil or sterilized field soil
- Designated groups inoculated with 0.25 tsp. of commercial brand Plant Success Endo and Ecto-Mycorrhizae. Remaining groups were not inoculated
- Plants were kept in a lab under grow lights with a regular watering schedule for the duration of the experiment (3 weeks).
- Measurements of shoot length and chlorophyll content were collected once weekly. Above and below ground biomass recorded at the conclusion of the experiment.
- Shoot length was measured from the base of the plant to the tip of the shoot.
- Chlorophyll content was measured with a SPAD meter, taking the average of 20% of the total leaves of each plant.
- Two-way ANOVA was used for statistical analysis of the data, setting a P-value less than 0.05 as significant.

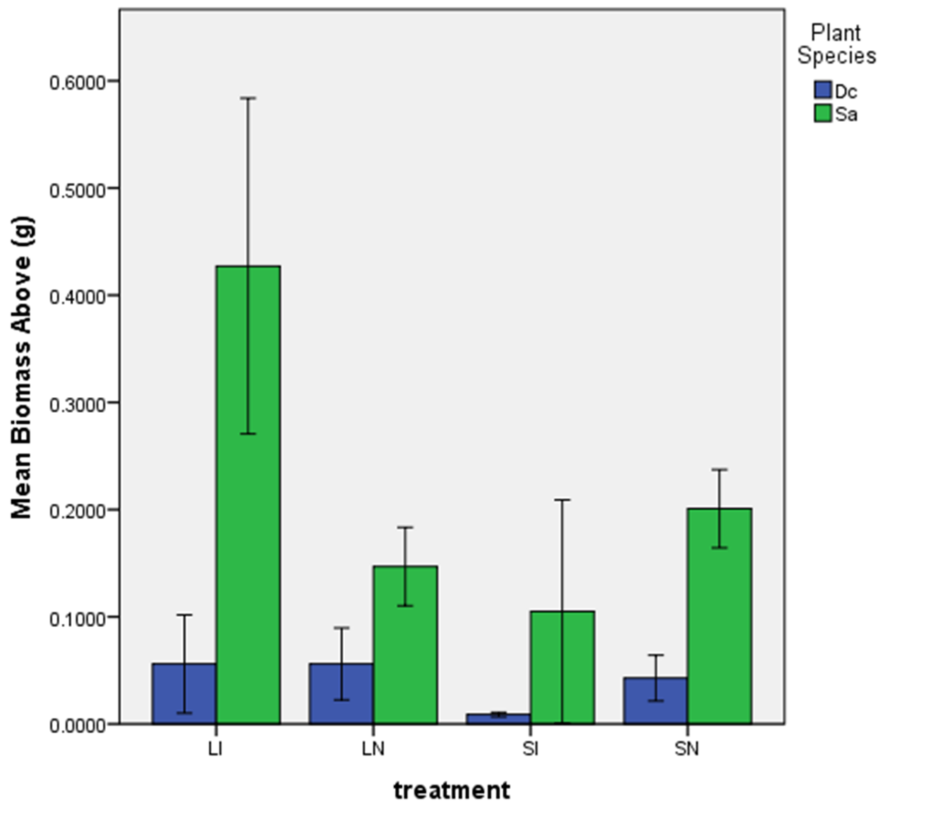

Fig 1. Average Biomass Above Ground for *Desmodium canadense* (Dc) and *Salvia azurea* (Sa) under living inoculated (LI), living non inoculated (LN), sterile inoculated (SI), and sterile non inoculated (SN).

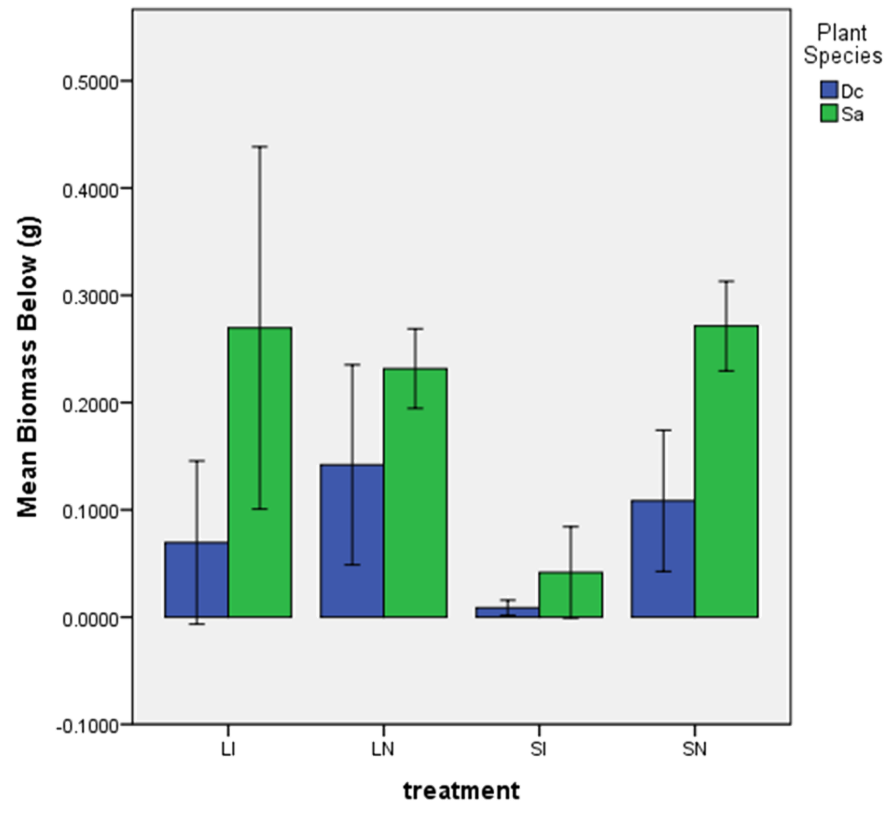

Fig 2. Average Biomass Below Ground for *Desmodium canadense* (Dc) and *Salvia azurea* (Sa) under living inoculated (LI), living non inoculated (LN), sterile inoculated (SI), and sterile non inoculated (SN).

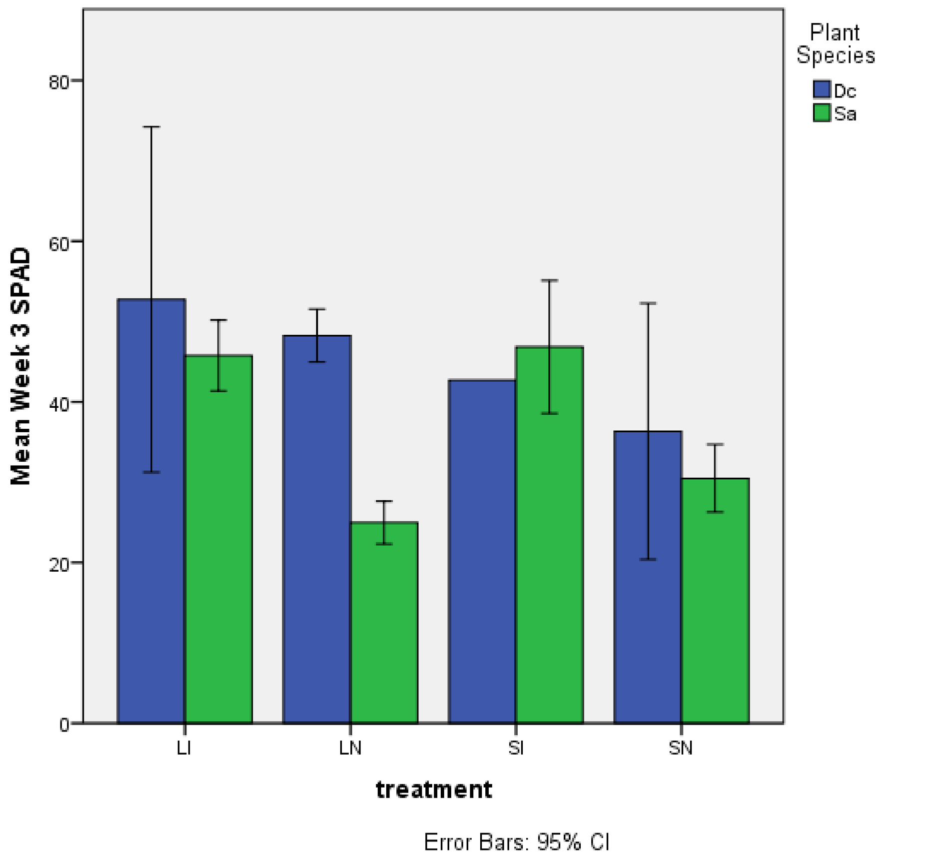

Fig 3. Average Chlorophyll Content for *Desmodium canadense* (Dc) and *Salvia azurea* (Sa) under living inoculated (LI), living non inoculated (LN), sterile inoculated (SI), and sterile non inoculated (SN).

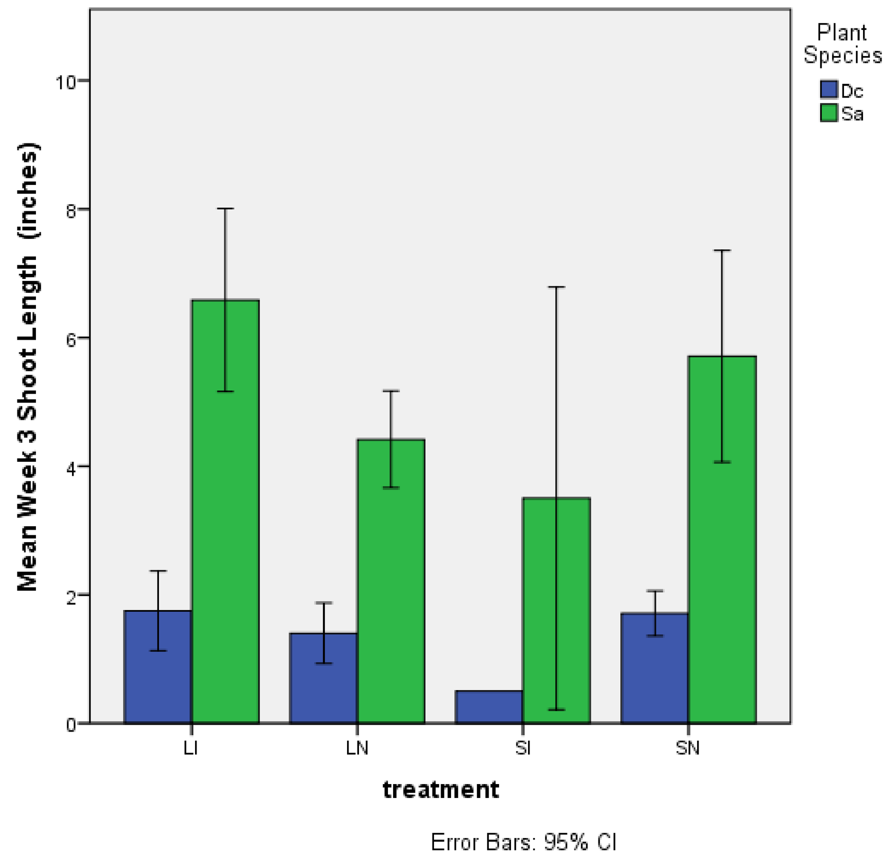

Fig 4. Average Shoot Length for *Desmodium canadense* (Dc) and *Salvia azurea* (Sa) under living inoculated (LI), living non inoculated (LN), sterile inoculated (SI), and sterile non inoculated (SN).

Results

- Above ground biomass showed significant response for treatments of Soil p= .000, Inoculum with Soil p= .000 (Fig.1)
- Above ground biomass did not show significant response for Inoculum treatment p= .065 (Fig.1)
- Below ground biomass showed significant response for treatments of Inoculum p= .000, Soil p= .003, Inoculum with Soil p= .002 (Fig.2)
- Chlorophyll content showed significant response for Inoculum treatment p= .000 (Fig.3)
- Chlorophyll content did not show significant response for treatments of Soil p= .205, Inoculum with Soil p= .832 (Fig.3)
- Shoot length showed significant response for Inoculum treatment with Soil p= .001 (Fig.4)
- Shoot length did not show significant response for treatments of Soil p=.102, Inoculum p=.582 (Fig.4)

Literature Cited

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Discussion/Conclusions

The significant response among above ground biomass, below ground biomass, and shoot length supports our hypothesis that commercial AMF would have a significant interaction with native AMF in the two species observed**. This shows that plants need native AMF as well as commercial AMF for optimal growth**. Chlorophyll content was the only measured factor that showed evenly higher levels of response for both species under all soil treatment levels. **The *Salvia azurea* plants did better as a whole under all types of soil treatments as compared to the *Desmodium canadense* plants, with the exception of chlorophyll content in living inoculated (LI) and living non-inoculated (LN) soil**. Specifically looking at sterile soil combined with inoculated soil *Salvia azurea* did better compared to *Desmodium canadense*. This could have been due to damaging interactions of *Desmodium canadense* with the incorrect type of AMF **The *Desmodium canadense* plants did not do as well overall, ending with only a total of 2 living plants in the sterile, inoculated soil**. This low sample size could have been part of the reason for the lower significance that resulted.

Further tests could look into the effects of different types of AMF on these two species to determine if there is an optimal symbiotic relationship. Tests could be conducted over a longer period of time with a larger sample size. Additional tests could look into why the *Salvia azurea* species still continued to do well under soil that is both sterile and non inoculated.

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