

Introduction

Background

- mycorrhizal relationships within the majority of plant species improve the fitness of both plant and fungal symbionts (Johnson, 1997).
- Mycorrhizal fungi grow into the roots of a plant and provide increased surface area, water uptake, and nutrient uptake (Marschner, 1994). In turn the plant provides carbohydrates to the fungi.
- Mycorrhizae symbiotic relationship can exist anywhere within a large spectrum of parasitic to mutualistic associations (Klironomos, 2003).
- Plants tend to grow more effectively with their native fungi compared to commercial fungi inoculant (Rowe, 2007).

Hypothesis

- Plant height, leaf area, and biomass will all be greatest in treatments of soil that is not sterilized and possesses mycorrhizae and soil that is not sterilized but does not possess mycorrhizae where the natural mycorrhizae is present because of sympatric associations between the natural mycorrhizal species and the plants.

Methods

Our two plants species for the experiment were the *Helianthus annuus* (Ha) and the *Ratibida columnifera* (Rc). Our sample size was 48 plants total with 24 plants per species and 6 plants per test group. The four treatments levels as follows. 1. commercial mycorrhizal inoculum present, non-sterilized prairie soil. 2. Commercial mycorrhizal inoculum present, sterilized prairie soil. 3. Commercial mycorrhizal inoculum absent, non-sterilized prairie soil. 4. Commercial mycorrhizal inoculum absent, sterilized prairie soil. On a weekly basis the height of each plant was recorded. At the end of the experiment plant biomass, height, and leaf area were measured. The plants were placed in a randomized order under the grow lights to ensure equal growing conditions for all treatment levels. The plants were harvested and dried after 8 weeks to measure the root and shoot biomass. We used ANOVA in SPSS to measure the significance of our results.

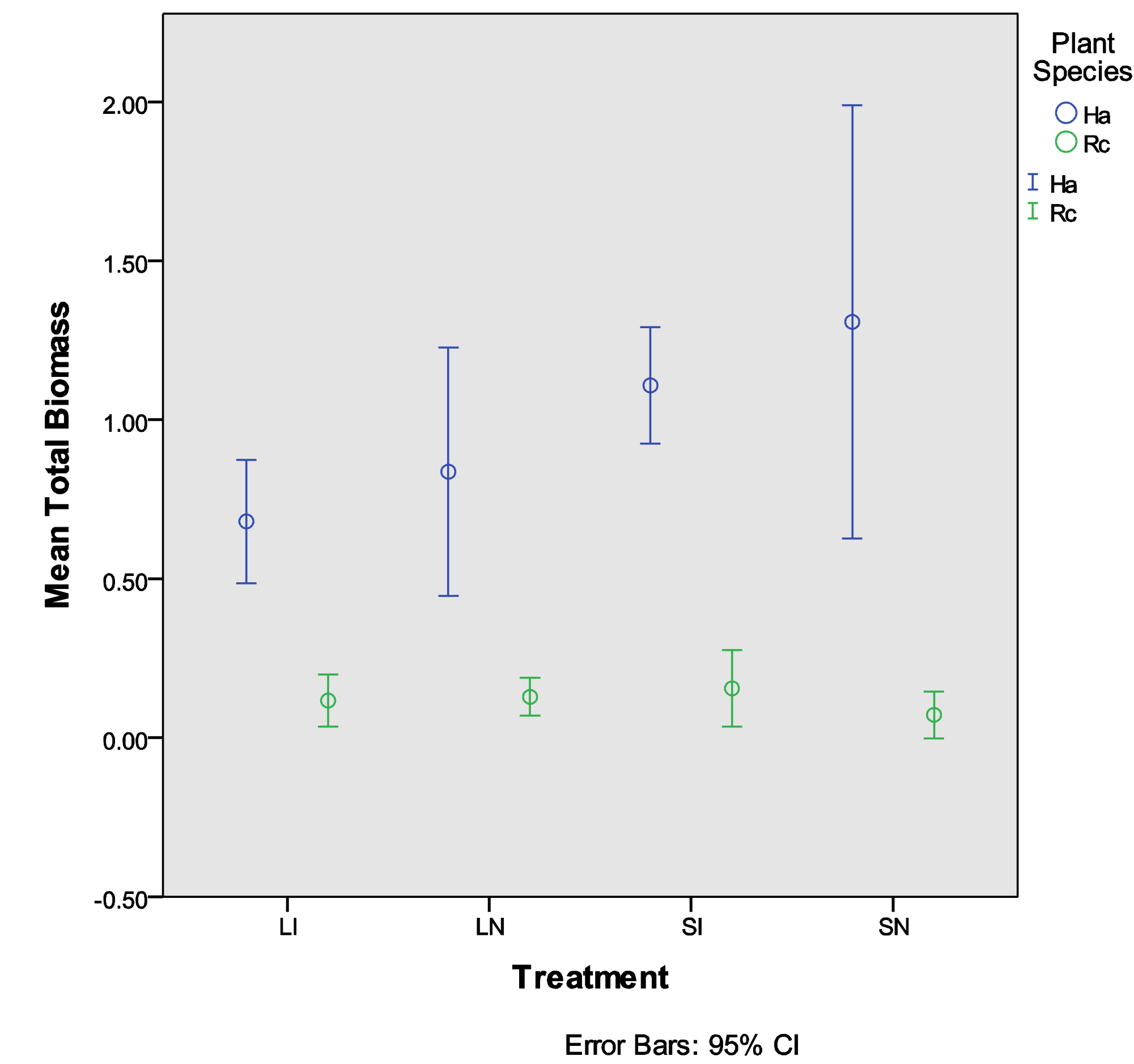
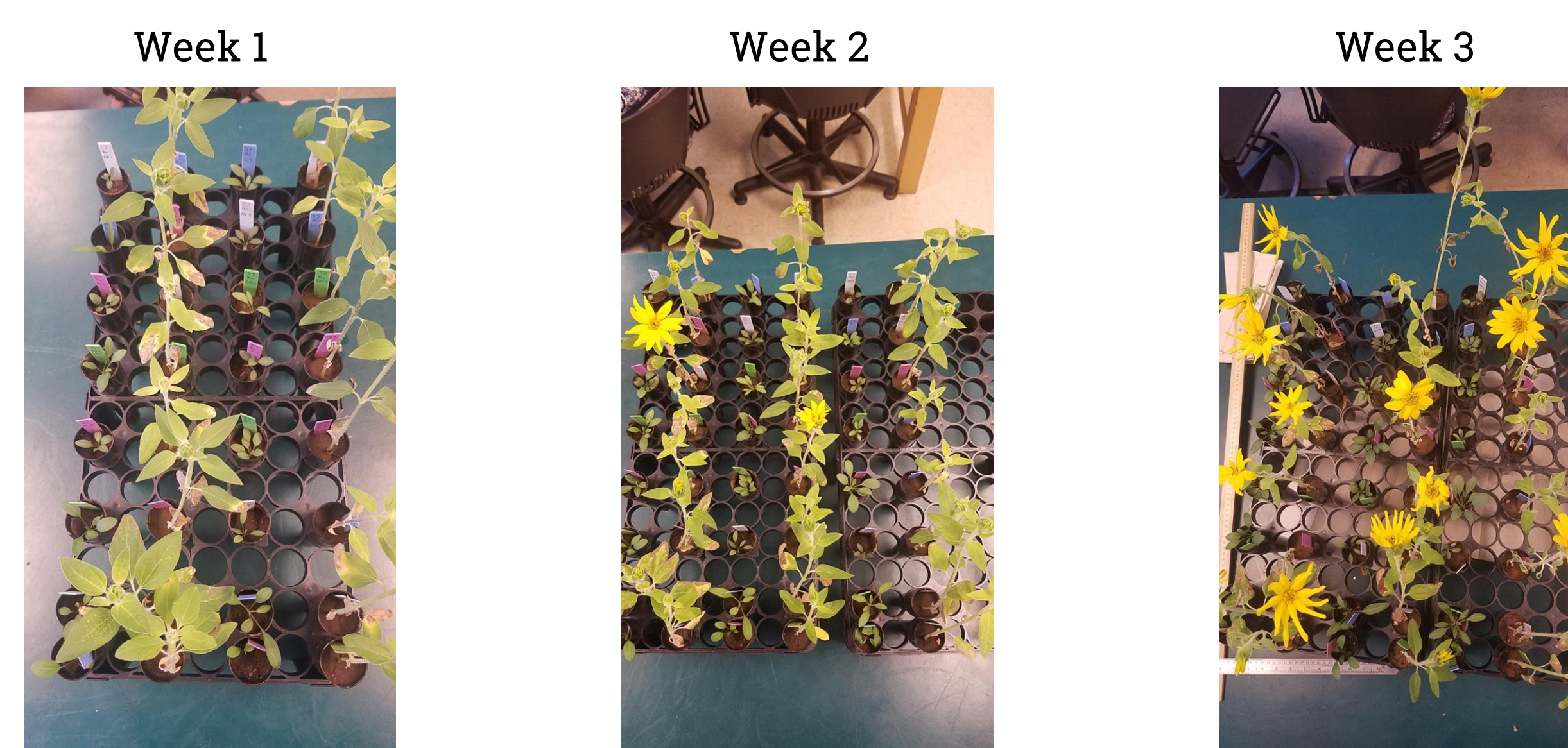


Figure 1: Mean total biomass as a function of mycorrhizal treatment.

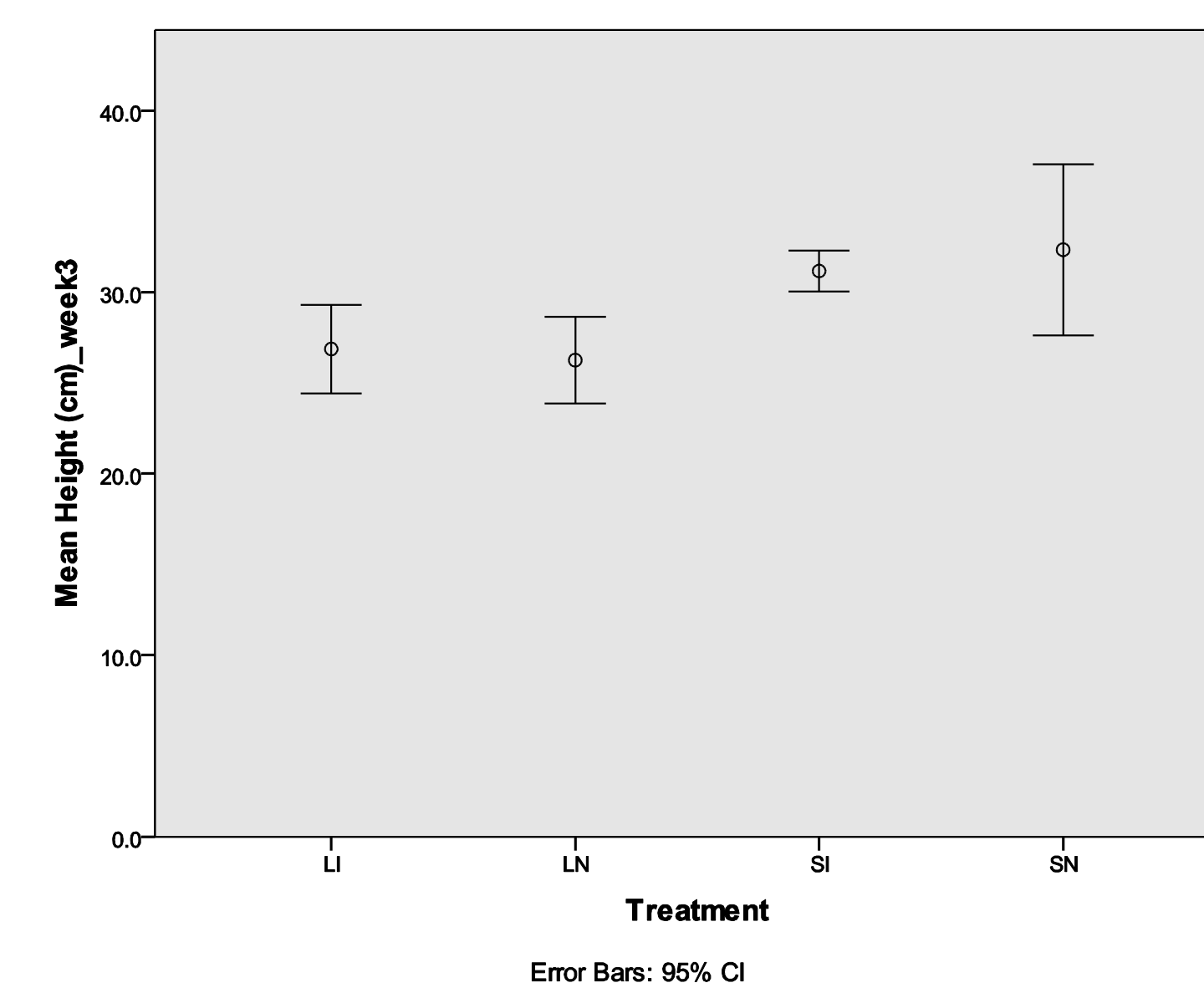


Figure 2: Mean height of *Helianthus annuus* during week 3 as a function of treatment.

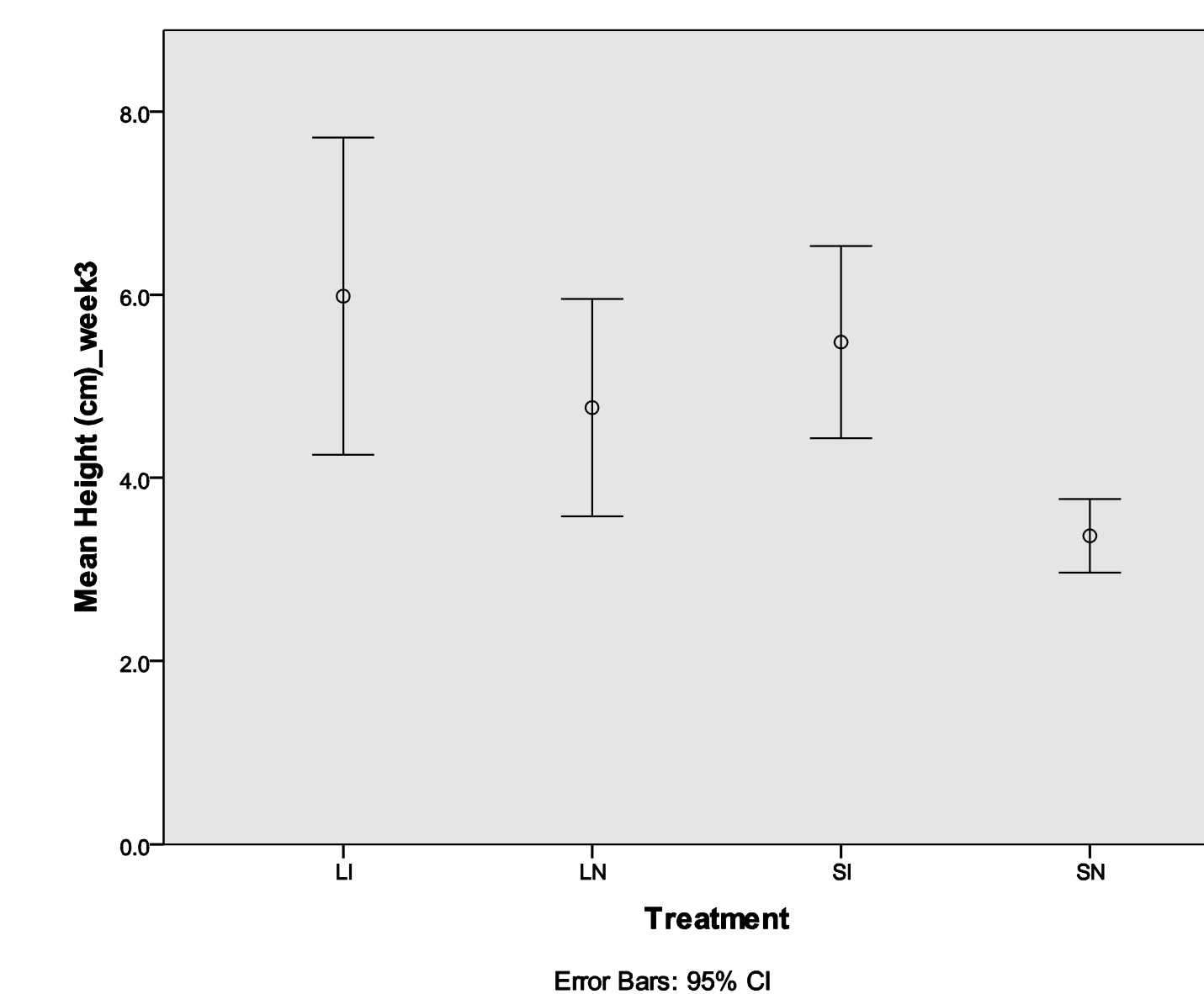


Figure 3: Mean height of *Ratibida columnifera* during week 3 as a function of treatment.

Results

- For Total Biomass we had a significant effect for soil treatment ($F=7.14$, $P=.011$). No significant effect for inoculum treatment. Refer to figure 1.
- For Ha height in week 3 we had a significant effect from soil treatment ($F=20.28$, $P=0.00$). No significant effect for inoculum treatment. Refer to figure 2.
- For Rc height in week 3 we had a significant effect from inoculum treatment ($F=12.95$, $P=.002$). No significant effect for soil treatment. Refer to figure 3.
- No significant effect between treatment levels for mean leaf area was found.

Conclusions

The addition or sterilization of the live soil appears to have the largest effect both on plant height and biomass. For *Helianthus annuus* that effect seems to be negative, while its effect on *Ratibida columnifera* is very slightly positive. This could be due to sunflowers having a negative association with the native mycorrhizal fungi but previous research has documented that sunflowers have a fairly strong positive relation with mycorrhizae (Soleimanzadeh 2012). If that is true then the most likely explanation to our results is that during the sterilization a negative factor, possibly a parasite, was removed from the soil, allowing better growth from the plants in the SN and SI treatments.

Our hypothesis was not correct. The opposite was true for the common sunflower and the differences in the mexican hat flower growth was not large enough to be considered significant.

For future research the experiment should be repeated in a similar fashion but with extra precautions taken in order to assure the live soil has no parasitic bacteria or organisms. The results could be compared to confirm or deny the presence of a negative factor in the live soil other than the native mycorrhizae.

Literature Cited

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