Plant microbe interactions between *Brachypodium distachyon* and *Fusarium oxysporum* across seven accessions

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Abstract

Brachypodium distachyon is a model system for functional genomics in grasses, due to its small and highly homozygous genome size, close relativity to wheat, and rapid life cycle. Similarly, the strain of *Fusarium oxysporum*, Fo. 47, is ideal in this experiment because of the fact that it is nonpathogenic, endophytic, and is known to have growth-promoting properties. This study aimed to observe the response in each of the seven accessions of *Brachypodium distachyon* to the fungal strain, Fo. 47. Seven different accessions of *B. distachyon* were first vernalized, then planted. After growing in the greenhouse for two weeks, half of the plants were inoculated with inoculum concocted from fungal cultures, while the other half were inoculated with distilled water. Four weeks post-inoculation, imaging and analysis of the plants showed Bd21 and Spa-S6D to have a significant increase in above ground biomass. The remaining accessions, however, revealed insignificant data. Nonetheless, this study shows the ability of *Fusarium oxysporum* to affect the above ground biomass of *Brachypodium distachyon*, more specifically, the ability to increase overall area.

B. distachyon root system

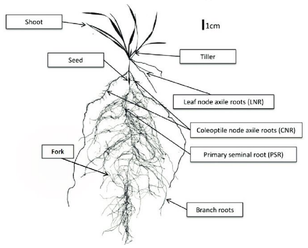

Figure 1: Labeled diagram of *Brachypodium distachyon* plant

The plants were inoculated before the flowering stage, in order to allow the plants time to grow, as well as the fungus to penetrate the roots, before senescence.

When soaked in inoculum containing Fo. 47, fungal spores are able to enter the roots of the plants and affect their growth patterns.

Methods

Vernalization
Seeds were wrapped in a damp paper towel, surrounded by tin foil, and refrigerated for two weeks to germinate.

Planting
Seven accessions of Brachypodium distachyon were planted. Half of the plants were treatment, and the other half were control.

Fungal cultures
Sucrose growth media, Fo. 47 (MT), and hygromycin solution were combined and shaken in order to make the inoculum.

Inoculation
To inoculate, each treatment plant were soaked in a combination of DI and inoculum for 45 minutes, then transplanted into cones.

Imaging
All plants were imaged four weeks post-inoculation.

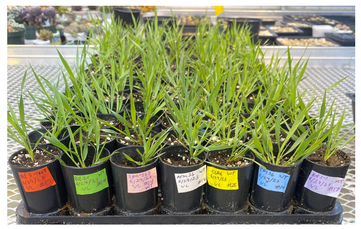

Figure 2: Seven accessions of *Brachypodium distachyon* planted (Left to right: Bd3-1, Bd21, Spa-S6D, Arm2b, CSR6, TR13b, Bd1-1)

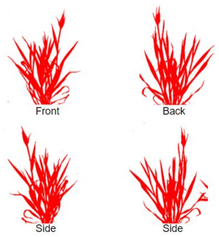

Figure 3: Plant macro demonstration

Introduction

Endophytes are microscopic organisms that inhabit the internal tissues of living plants, causing no harm to their host plants. They are valuable because they generate various bioactive compounds and exhibit biocontrol potential against significant plant pathogens, either by stimulating plant defense mechanisms or by enhancing plant growth. Several studies have reported the successful use of endophytic BCAs, mainly on vegetable and fruit crops, improving overall plant growth.

Results

Using the images in Figure 3, the total area of each plant was recorded through a macro. These areas were then plotted into a box plot (Figure 4), showing the significance of each accession when comparing the control and the treatment plants.

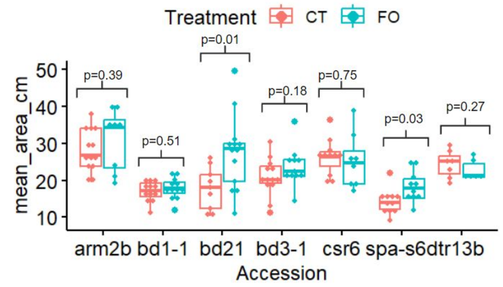

Figure 4: Total area of seven B. distachyon accessions

Certain accessions of *B. distachyon* respond to the presence of Fo. 47 through a significant increase in above ground biomass. Figure 4 shows that accessions Bd 21 and Spa-S6D showed a significant increase when inoculated with Fo 47, while the other accessions yielded inconclusive results.

Objectives

- Observe response to Fo. 47 in each accession of *Brachypodium distachyon*
- If various accessions of Brachy are inoculated with Fo. 47, then each accession will respond to the treatment in a certain manner, affecting above ground biomass.

References

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Future Directions

The next step is to harvest and section the plant roots. Sectioning the roots will allow a better visualization of the fungal hyphae living in the root cortex. These sections can be analyzed using a stain and imaged in order to prove the presence of the fungus, Fo. 47, in the Brachy roots.

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