Fungal Endophytes Interact with Endophytic Yeast Isolated from Soybean Leaves

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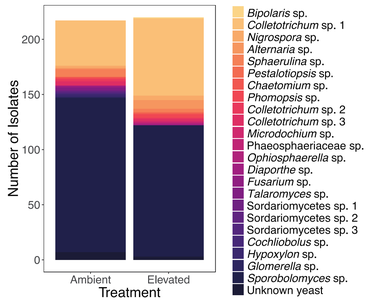
PRECS Phenotypic Plasticity Research Experience for Community College Students

Introduction

•Endophytes (*endo = inside* and *phyte=plant)* are microscopic fungi that live inside of the leaves of all species of plants and can have beneficial effects on their hosts.

•Previous work in our lab has shown a significant decrease of *Sporobolomyces* sp., an endophytic yeast, within soybean hosts exposed to elevated levels of CO_2 *(See the figure).*



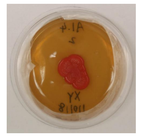
•*Sporobolomyces* sp. has certain properties to enable them to act as natural biocontrol agents. This pink yeast may have untapped potential to protect crops from pathogenic organisms.

• If *Sporobolomyces* sp. interacts with fungal pathogens, it may have strong effects on other fungal endophytes in the community.

The aim of this experiment was to: Examine how *Sporobolomyces* sp. interacts with endophytes isolated from soy leaves both in terms of fungal growth and phenotypic changes.

Methods

- 31 fungal samples were cultivated in Petri Dishes with Malt Extract Agar. These samples were previously isolated from leaves of soy plants.
- Plates were spread with a *Sporobolomyces sp.* suspension.



- From each sample four fungal plugs were taken and each placed in the center of the yeast plates (Y+). An additional four plugs were placed on control plates (Y-) that lacked the yeast suspension.
- The growth and interactions of the fungi and yeast were compared between the Y- and Y+ groups.
- For Experiment 1, the yeast were cultivated overnight before plating the fungi. For Experiment 2, the cultivation of yeast was increased to four days.

Results

1

Species	Sample	Experiment 1	Experiment 2
Alternaria sp.	A2.6.6		
Alternaria sp.	E2.3.11		
Bipolaris sp.	E2.6.7		
Chaetomium sp.	A2.5.7		
Chaetomium sp.	E2.10.4		
Cochliobolus sp.	A3.1.15		
Colletotrichum sp. 1	A2.15.1		
Colletotrichum sp. 1	E3.5.10		
Colletotrichum sp. 2	A3.5.4		
Colletotrichum sp. 2	E1.8.4		
Colletotrichum sp. 3	A2.6.3		
Colletotrichum sp. 3	E2.2.4		
Diaporthe sp.	A1.7.8		
Diaporthe sp.	E3.4.15		
Fusarium sp.	A1.13.2		
Glomerella sp.	A1.13.13		
Hypoxylon sp.	A2.15.15		
Microdochium sp.	E2.5.13		
Nigrospora sp.	A1.3.4		
Nigrospora sp.	E2.2.7		
Ophiosphaerella sp.	E3.12.10		
Pestalotiopsis sp.	E1.6.11		
Phaeosphaeriaceae sp.	E2.7.16		
Phomopsis sp.	A3.11.4		
Phomopsis sp.	E2.5.5		
Sordariomycetes sp. 1	A1.6.15		NA
Sordariomycetes sp. 2	A3.5.2		
Sordariomycetes sp. 3	A3.3.5		
Sphaerulina sp.	A2.4.8		
Sphaerulina sp.	E2.13.5		
Talaromyces sp.	A1.5.8		

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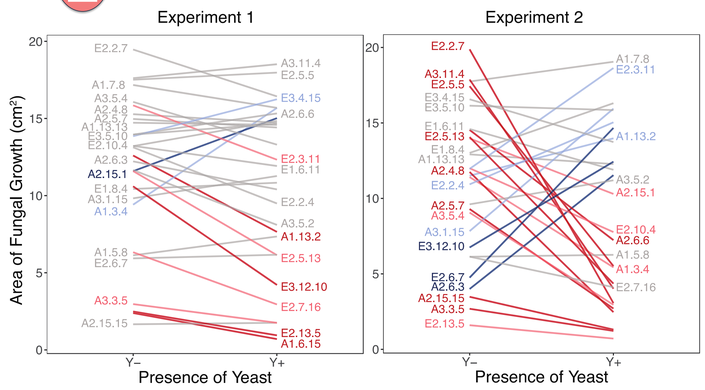
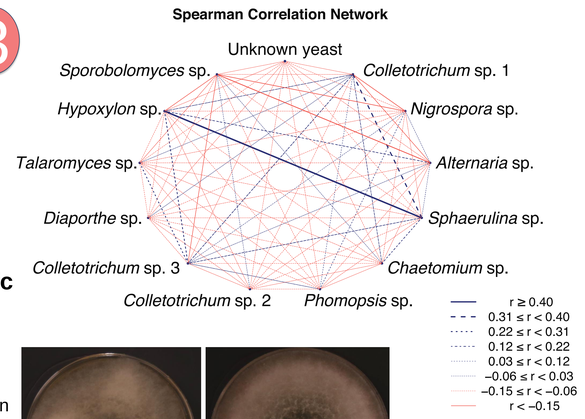
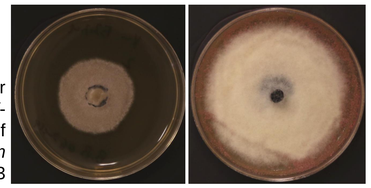


Yeast Increases Growth (significant)
Yeast Increases Growth (non-significant)
Yeast Does Not Affect Growth
Yeast Decreases Growth (non-significant)
Yeast Decreases Growth (significant)

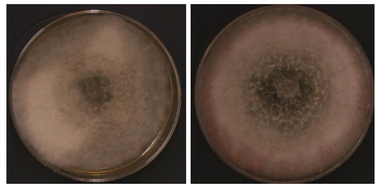
1. **The presence of the yeast caused more changes in fungal growth in Experiment 2 compared to Experiment 1. Overall, the effects on fungal growth tended to be negative.**
2. **The magnitude of these changes in growth was greater in Experiment 2 compared to Experiment 1.**
3. **Previous work in our lab identified positive and negative correlations between fungi and yeast in soybean. Most of the fungal endophytes were predicted to have negative correlations with *Sporobolomyces* sp., but this was not always the case in our experimental tests.**
4. **The presence of yeast also caused phenotypic changes in certain fungal endophytes.**

3





Change in color and size in Y- and Y+ plates of *Colletotrichum* sp. 3



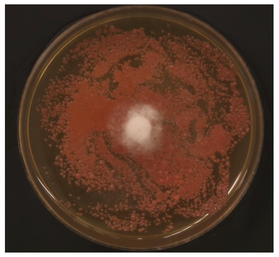
Change in fungal patterns in Y- and Y+ plates of *Alternaria* sp.

Conclusions

•Individual fungal endophyte species exhibited a wide range of responses when interacting with an endophytic yeast species.

•*Sporobolomyces* sp. may influence the population growth of other endophytic fungal species in its community, which could have positive or negative effects on plant health and physiology.

A Y- plate from the *Alternaria* sp. group.



A Y+ plate from the *Alternaria* sp. group experiencing an inhibition of fungal growth from the pink yeast.

Future Work

We will conduct a third experiment testing how *Sporobolomyces* sp. affects growth of *Colletotrichum* sp.1 isolated from ambient and elevated CO_2 environments.

References

Hiber-Bodmer, et al. (2017). “Competition assays and physiological experiments of soil and phyllosphere yeasts identify *Candida subhashii* as a novel antagonist of filamentous fungi”. BMC Microbiology.

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Acknowledgments

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