A Mycological Investigation of Darwin's Naturalization Hypothesis

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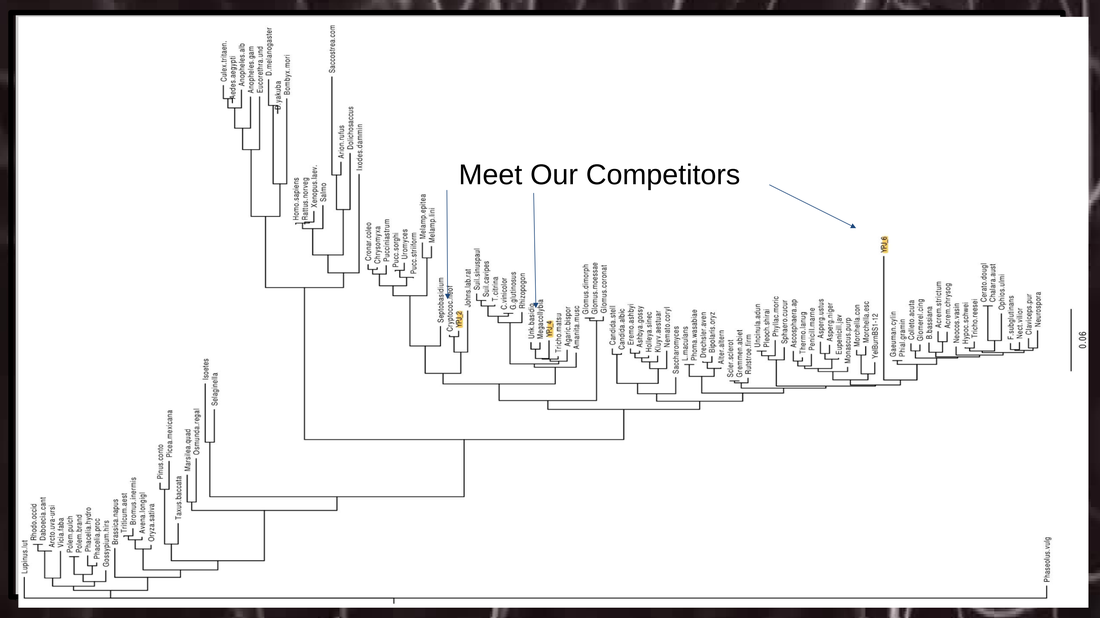


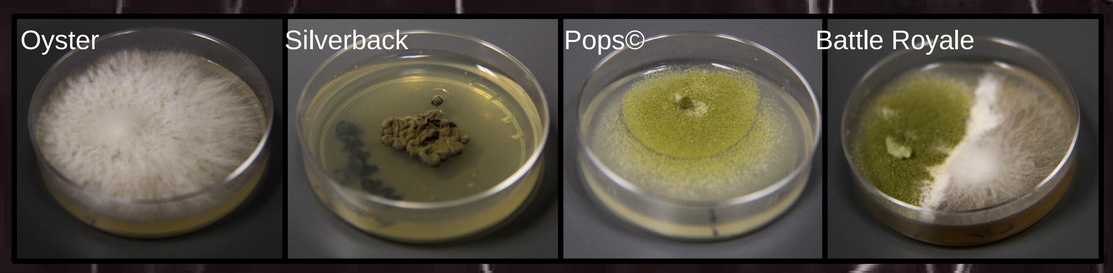
(Figure 1 A phylogenetic tree showing the three isolates highlighted in yellow)

Problem

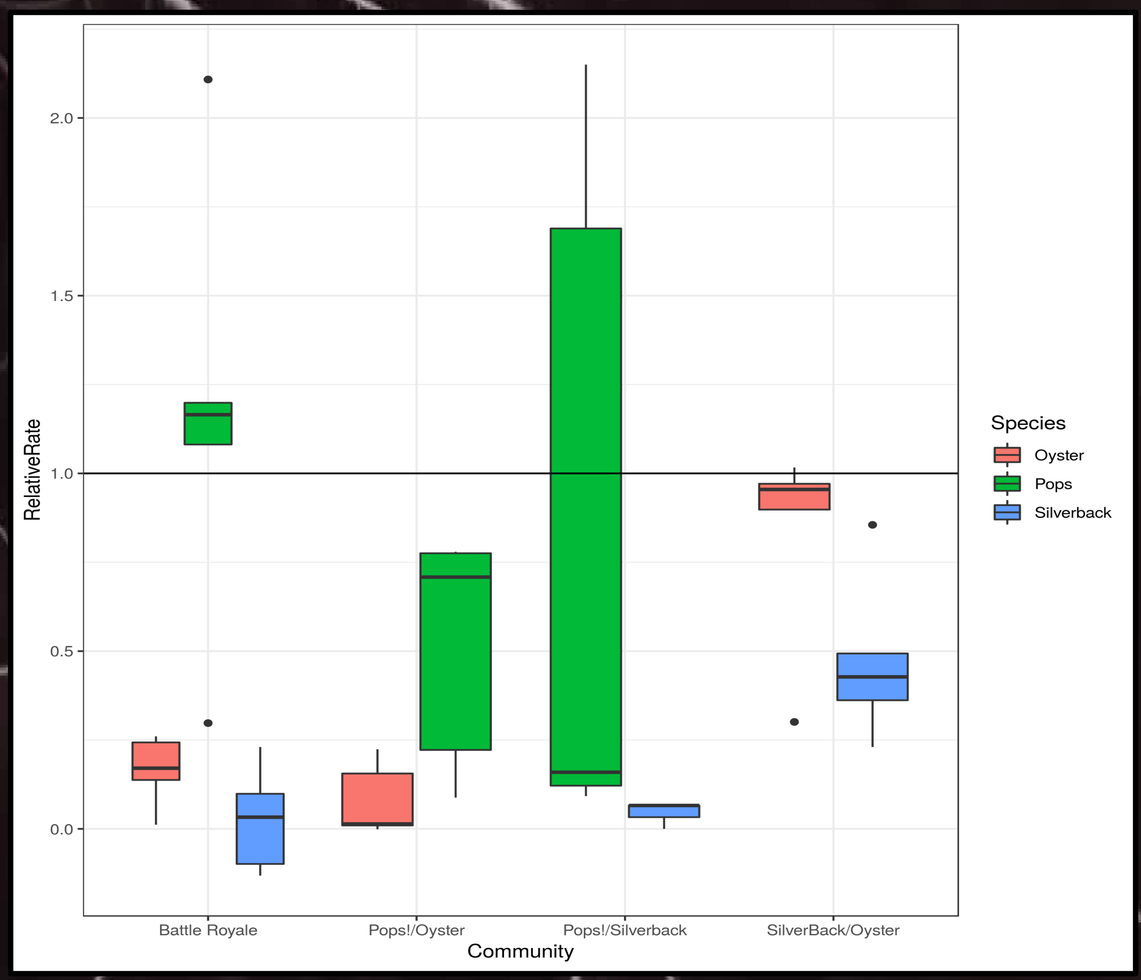
Charles Darwin believed that colonization is less likely to be successful when the colonizing species are related to members of the invaded community, because evolutionary closeness intensifies competition among species that share similar resources. Much research on Darwin's Naturalization Hypothesis has been done based on plant or animal competition and his hypothesis has remained unscathed by a majority of these studies. The question for this study, then, is whether or not this holds for fungal species as well. In particular we would focus on Ascomycete and Basidiomycete fungi.

Who cares

This question has potential importance for agriculture and commerce. The growth and proliferation of a harmful or otherwise undesirable fungus may be inhibited by the presence and activity or metabolites of another less harmful species. Ideally, compounds could be isolated from the inhibitory fungus to control the malicious strain without the need to actually grow the inhibitor locally. Procedures could be implemented for many commercial benefits, but most obviously for increased crop yields in species that are regularly damaged by fungi and for predicting and controlling biological invasions.



(Figures 2.1- 2.4)



(Figure 3 The competitive growth rate of each community compared to their uninhibited growth rate)

Methods

Three fungal isolates were cultured from the environment, including one known outgroup.

Competitions were created by cultivating plates inoculated with each possible pairing of 2 isolates, as well as a set containing all 3 varieties. Five replicates were prepared for each test, measured every 3 days, and the rates of growth for each strain in a set were observed. These rates were expressed as a proportion to the baseline growth rate of isolates in pure culture.

DNA was extracted from each strain and the ITS1-28S region of the rDNA was sequenced to confirm species identification and determine phylogenetic relatedness.

Conclusion

Looking at the results, an interesting phenomenon occurred. Pops© (YPJ_6) inhibited the growth of the other two fungal isolates, and actually grew better in competition. Reduced growth rate for Silverback (YPJ_2) was subtle, while Oyster's (YPJ_4) growth inhibition was incredibly visible (see fig 2.4).

Sequencing data for Pops© revealed it to be the fungal parasite, *Mycosymbioces mycenaphila*, an Ascomycete. Both Oyster, *Pleurotus ostreatus*, and Silverback, *Filobasidiella neoformans*, are Basidiomycetes. We conclude that phylogenetic distance is not the primary factor in the competition of these isolates.

Further research would require additional species and the elimination of confounding factors, such as a parasitic outgroup. This would provide a more accurate analysis of the Naturalization Hypothesis among Fungal species.

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