Endophytes and pathogens in endangered Hawaiian endemics: plant conservation from a microbial perspective

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Fungal endophytes and epiphytes modify plant disease

Raghavendra and Newcombe, 2013

Buxdorf, et al., 2013

Arnold, et al., 2003

Busby, et al., 2015
Phyllostegia kaalaensis

- O‘ahu endemic
- Extant only in two greenhouse populations
- Ecological extinction blamed on habitat loss, feral ungulates, and invasive pathogens
- Greenhouse populations dependent on regular applications of fungicides
- Outplanting efforts typically fail within months
- New approaches needed
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Neoerysiphe galeopsidis disease progression

~30 Days
Study Design Overview

Phyllostegia hirsuta

Filtered (100 µm)
Leaf Slurry from healthy wild relative

Sterile H2O

Cultured isolates from wild relatives

Fungal isolates from *P. mollis* and *P. hirsuta*
Gratuitous photo of field site
Slurry from wild relatives decreased disease severity
ITS Amplifications

Paired-End Illumina MiSeq

Merge reads (Pear)

ITSx

Open-Ref OTUs against UNITE
So, who was in that beneficial leaf slurry inoculum?

Turns out, it was mostly the pathogen we were trying to prevent! *(N. galeopsidis)*
*Pseudozyma aphidis* corresponds with lower disease load
Acknowledgements

PI:
Anthony Amend

Funds:
Oahu Army Natural Resources Program

Undergrad servant:
Brooke Sedlmeyer

Logistics:
OANRP Rare Plant Program Folks
Sordariomycetes sp
Phyllosticta capitalensis
Colletotrichum cymbidiicola
Colletotrichum xanthorrhoeae
Neofusicoccum parvum
Alternaria alternata
Aspergillus cibarius
Xylariaceae sp
Sordariomycetes sp
Penicillium restrictum
Colletotrichum brevisporum
Fungal Isolates used as inoculum
NMDS (Bray) by sample date

Heatmap - P. kaalaensis