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## **Time and Environment Influence Abundance of Fungal Microbe Associated with Sagebrush Leaves**

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# Time and Environment Influence Abundance of Fungal Microbe Associated with Sagebrush Leaves

## BACKGROUND

- Sagebrush ecosystems are threatened by environmental stressors
- Plant-associated microbes influence plant health
- *A. pullulans* is a yeast-like fungus of the phylum ascomycota
- Commonly associated with plant microbiome [1]
  - Identified on sagebrush leaf microbiome
- Extremotolerant [2]
  - able to persist in inhospitable environmental conditions
- Natural fungicide [3]
- Produces pullulan, an industrially important compound commonly used as a food additive [2]
- Ability to produce melanin, a protective mechanism against harmful UV rays [4]
- May extend protective benefits to plant hosts
  - potential for ecosystem restoration

## OBJECTIVE

This study's objective is to quantify the absolute and relative abundance of *A. pullulans* and analyze how time, host factors, and weather variables influence the population dynamics of the the sagebrush-associated microbe.

### Weather Variables

- precipitation
- wind speed
- air temperature

### Host Factors

- host plant
- leaf type

## METHODS

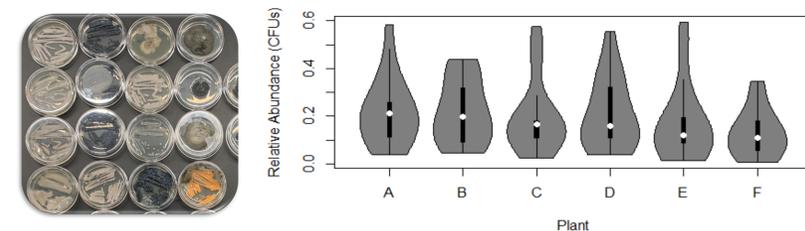
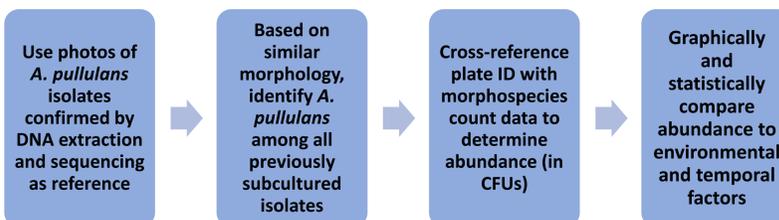


Fig. 1: Relative Abundance of *A. pullulans* across experimental sagebrush shrubs

## RESULTS

- No significant differences were found in absolute or relative abundance across plants (Fig. 1) or leaf type.
- Absolute and relative abundance of *A. pullulans* differed significantly across sampling dates (Fig. 2,  $p = 4.5 \times 10^{-7}$  and Fig. 3,  $p = 1.5 \times 10^{-4}$ , respectively).
- Negative correlations existed between absolute abundance of *A. pullulans* and air temperature (Fig. 4,  $p = 2 \times 10^{-16}$ ) as well as precipitation (Fig. 5,  $p = 4.23 \times 10^{-16}$ ), while no correlation was found between abundance and wind speed.
- No correlations between relative abundance and weather variables were found.

### Abundance Over Time

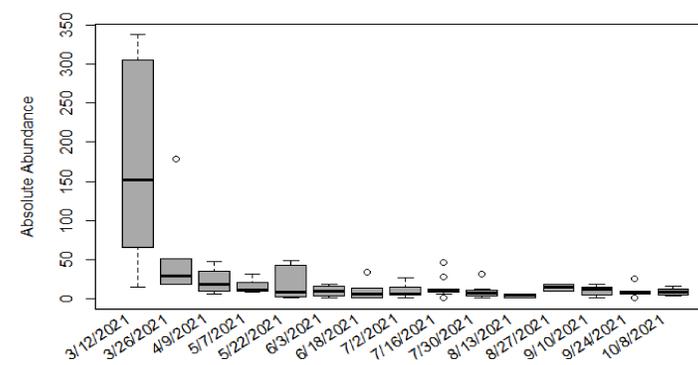
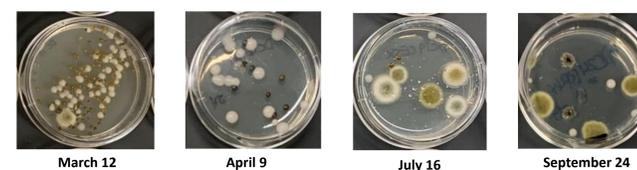


Fig. 2: Absolute abundance of *A. pullulans* over time



Cultured samples from four separate trips (above) show *A. pullulans* within the microbial community. *A. pullulans* appear as greenish to brown-black in color, small and round in shape, with a shiny to matte finish. The above examples demonstrate decreasing abundance of *A. pullulans* within the community cultures over the course of the growing season.

### Relative Abundance Over Time

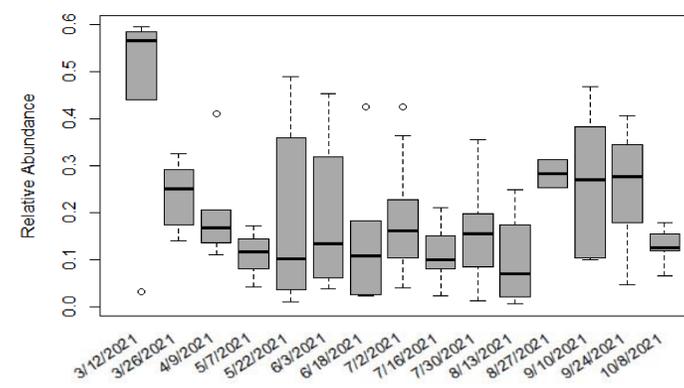
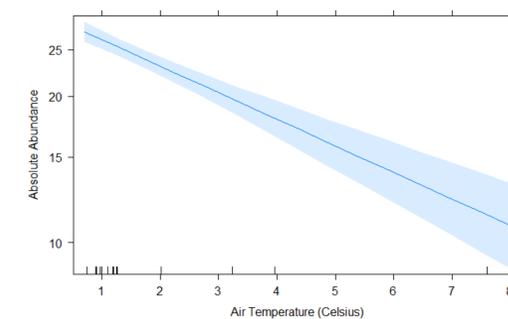
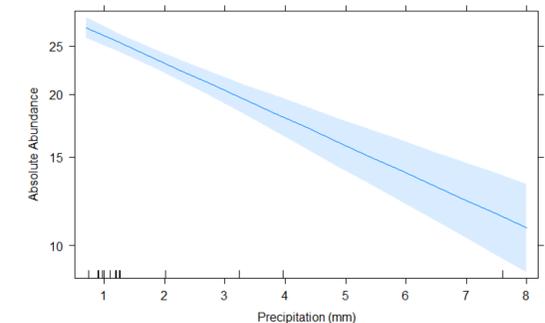


Fig. 3: Relative abundance of *A. pullulans* over time

Fig. 5 (right) and Fig. 6 (below): Generalized linear models demonstrate a negative relationship between absolute abundance of *A. pullulans* with precipitation and air temperature, respectively.



## FUTURE WORK

- Gain a more comprehensive picture of the dynamics of *A. pullulans* within the sagebrush leaf microbiome by analyzing data that encompasses a full year of cultures
- Perform more DNA extractions and sequencing to improve identification accuracy of *A. pullulans* isolates
- Determine whether morphology of *A. pullulans* is influenced by temporal or environmental factors
- Investigate potential interactions between *A. pullulans* and other microbes within the phyllosphere community
- Inoculate experimental sagebrush with *A. pullulans* to determine whether it affects plant growth, defense, or health

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