The Effects of Necromass on Bacterial Survival During Desiccation

E. Tobiczyk, H. Kittredge, S. Evans

Kellogg Biological Station, Michigan State University

1. Introduction

- Biofilms support 99% of microbial communities in soil by protecting them from adverse conditions, such as desiccation and toxins[1,2,3].
- Biofilm's structure is composed of extracellular components, such as DNA, polysaccharides, and osmolytes[1].
- The extracellular components in biofilms can be actively secreted by living microbes but are also passively introduced to the environment through the accumulation of dead cellular material called necromass.
- Necromass can account for up to 80% of organic carbon in soil[4]. This necromass could be beneficial to bacteria as a nutrient source or could offer physical protection.

It is not known if necromass can help protect bacteria from stressors in the same capacity as biofilms.

Research Question

Does Necromass Increase Bacterial Survival in Desiccated Switchgrass Soil?

3. Results

Necromass does increase bacterial survival, but the effect is similar to adding a nutrient control.

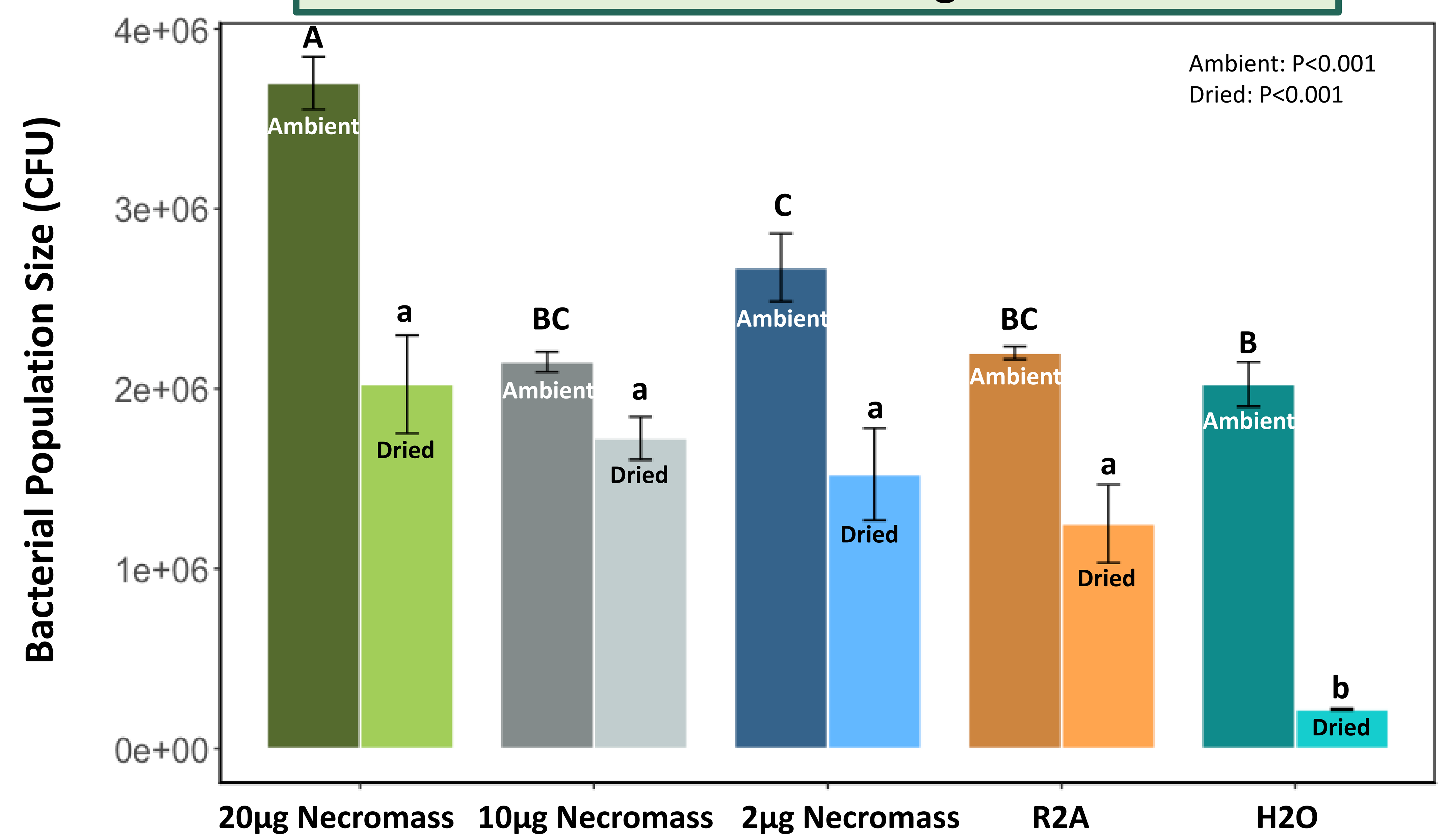
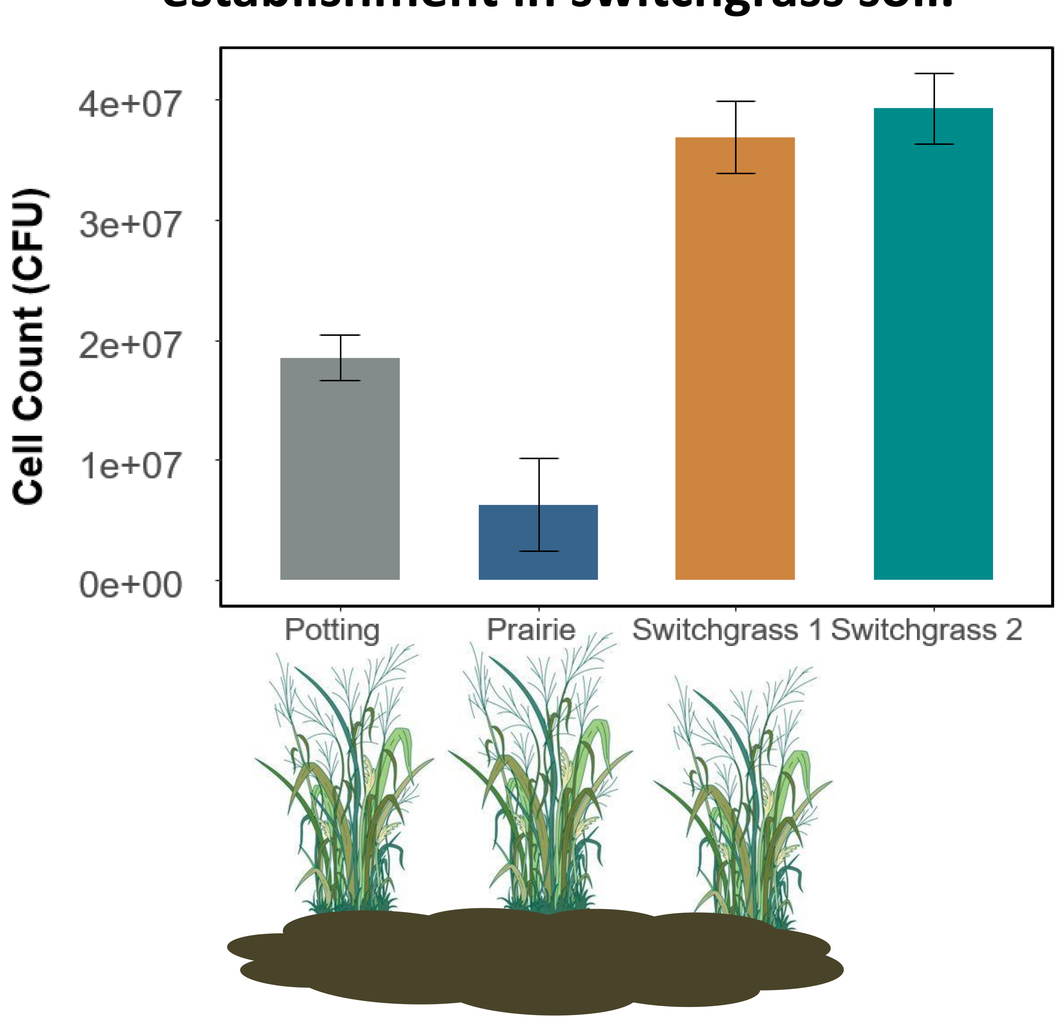


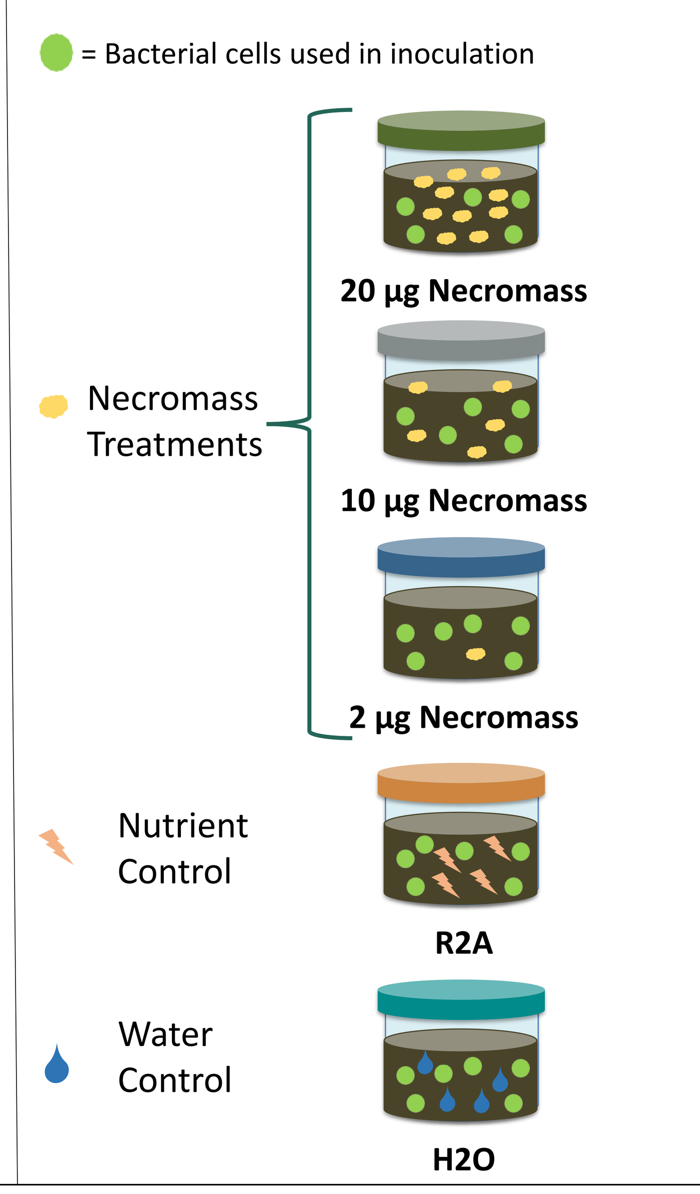
Figure 3: Bars represent average population size on the 12th day of the experiment, all treatments had 8 samples, 4 replications for each moisture manipulation. Error bars represent standard error.

2. Methods

Soil Inoculation → Incubation → Quantification

Bacteria had the highest rate of establishment in switchgrass soil.





Soil Moisture was manipulated to 0-5% and 25%

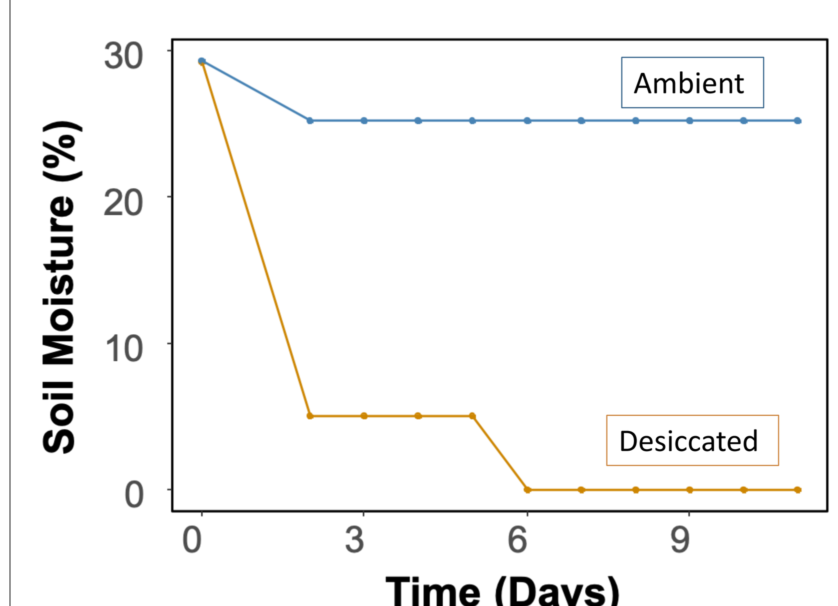
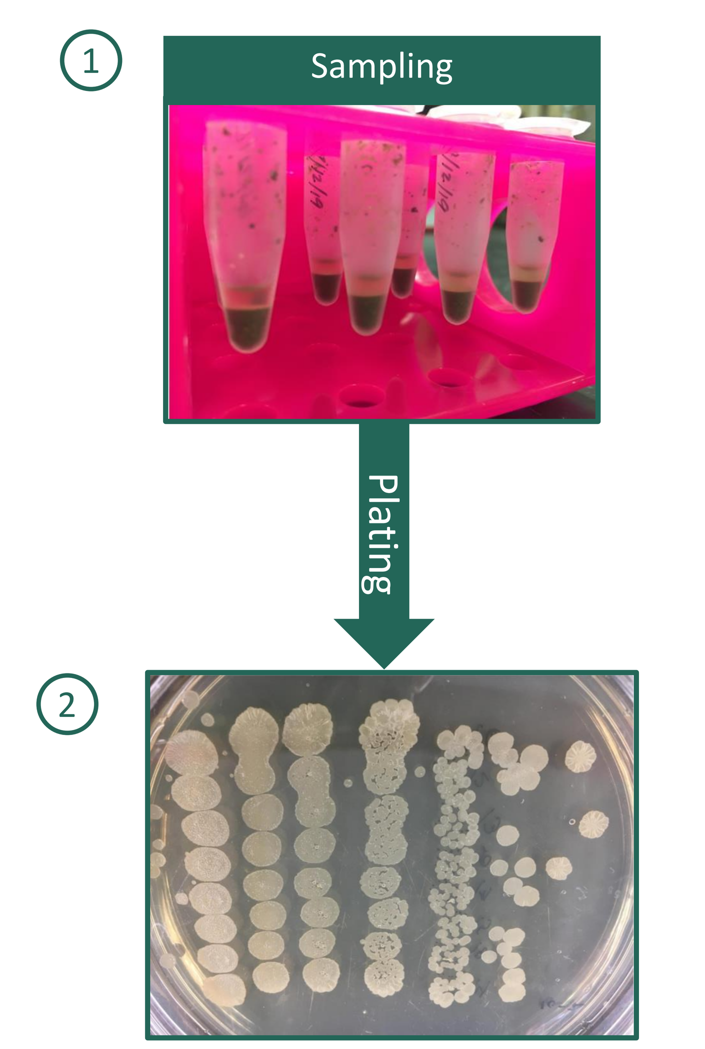


Figure 2: Desiccated and ambient soil moisture levels over the span of the experiment. Desiccated samples were dried to 5% soil moisture on day 1, then down to under 1% on day 5. Ambient samples were dried to 25% soil moisture and held there for the remainder of the experiment.



1. Samples were resuspended in media.
2. Then plated to quantify population size.

4. Conclusions & Future Research

- Introducing necromass to bacterial communities increased survival in switchgrass soil.
- Necromass only increased survival relative to the water treatment, not the nutrient control.
- The effect of necromass was independent of soil moisture stress.
- However, desiccation stress did not kill as many cells as anticipated.
- Moving forward it will be important to consider necromass as an important part of soil microbiology.

In the future, indirect interactions between living and dead cells could be considered when constructing microbial communities for drought tolerance.

Citations

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Acknowledgements

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