NC-ASM Research Abstract

Title: Microbiome colonization leads to emergent plant phenotypes at elevated temperature.

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Abstract: Abiotic and biotic stresses lead to reduced yield and billions of dollars of crop loss each year. To feed a growing global population in a warming climate, we must develop innovative new agricultural methods to improve plant stress tolerance and crop yield. One emerging method to meet these goals is through application of climate-selected microbial communities. Previous research shows that microbiome and plant functions are impacted individually by elevated temperature; however, we currently have little basic understanding of how microbiomes influence plant performance in a warming climate. To address knowledge gaps in “temperature-microbiome-plant” triangular interactions, my research simultaneously examines changes in microbial composition and plant performance at elevated temperature using Arabidopsis, tomato, synthetic and natural microbial communities. Indeed, this approach has revealed emergent properties including altered microbiome abundance, novel root and biomass phenotypes, and unique gene expression patterns that only occur in the presence of elevated temperature, microbiome colonization, and a plant. To predict these unexpected outcomes, my current and future work uses my findings to improve current mathematical models and predict microbiome changes in a crop at elevated temperature. This basic information alone will provide critical insight into plant-microbiome interactions in a warming climate and has the potential to reveal new principles of host-microbiome-environment interactions that could apply even beyond plant systems.