**Microbial driven variation in carbon flow & stabilization during root litter decomposition**

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https://www.lanl.gov/science-innovation/science-programs/office-of-science-programs/biological-environmental-research/sfa-microbial-carbon.php

Project Goals:

1. Identify predictive links between carbon flow and microbial traits.
2. Understand the interaction of microbial triats and environmental fluctuations.
3. Determine ecosystem level consequences of microbial driven variances in carbon flow.

**INTRODUCTION:**

This Science Focus Area (SFA) aims to inform climate modeling and enable carbon management in terrestrial ecosystems. Litter decomposition substantially contributes to the global carbon cycle, and recent evidence suggests microbial composition plays a role determining amounts and type of carbon flow during decomposition. Thus far, the majority of research examining the effects of microbial communities on litter decomposition have focused on plant litter and surface microbial communities. However, subsurface plant litter accounts for a large portion of annual litter production and turns over faster than surface material. Furthermore, belowground carbon inputs are more efficiently stabilized and the ultimate fate of soil carbon is dependent on subsurface dynamics. In the current study, we have three main questions:

1. What is the magnitude of microbial driven variation of carbon flow in the shallow subsurface during root litter decomposition, as measured by $CO_2$ and DOC?
2. Is there a relationship of DOC production and C and N stabilization on mineral surfaces?
3. Does N addition alter the magnitude of carbon flow or C stabilization on mineral surfaces?

To answer the above questions, dual-labeled blue grama root litter was incubated in a common garden microcosm experiment. Litter was inoculated with rhizosphere microbial communities derived from subsurface soils collected from ten elevational transects across the southwest. We found subsurface microbial communities produced DOC distributions similar to those produced by surface microbial communities during leaf litter decomposition, but subsurface communities produced $CO_2$ distributions that were an order of magnitude larger than surface microbial communities. These differences in carbon flow during root litter decomposition appear to be driven by bacterial rather than fungal communities. The addition of nitrogen had a significant effect on the diversity of both bacterial and fungal communities as well as carbon flows, but the effects varied by transect which originating microbes were isolated from. This suggests microbial communities present on litter alter the effect of nitrogen deposition on community composition and carbon flow. These results indicate that microbial communities on root litter play an important role in determining the magnitude and direction of carbon flow during decomposition. Future work will examine how these results related to carbon stabilization on mineral surfaces.

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