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Plant litter degradation and microbial defense by host-specific fungal endophytes

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Abstract: Decomposition of leaf litter by a diverse microbial community is a major biogeochemical process in the global carbon cycle. Fungi are considered the primary decomposers of plant litter, especially of highly recalcitrant lignocellulose matrices that make up the majority of cellulose in leaves. Many specialized fungal saprotrophs are found outside of plants and colonize leaves after leaf senescence, but a growing body of literature suggests that fungi found within healthy leaves - foliar fungal endophytes - prior to leaf senescence are also decomposers and may be "pioneers". In particular, the metabolomic activity of host-specific obligate endophytic fungi during litter senescence is an unexplored stage of rapid colonization and conversion of plant tissue matter for fruiting body development.

In the proposed work, we will set up microcosms to induce the production of host-specific enzymes and secondary metabolites by a phylogenetically diverse set of endophytic fungi. We propose combining the expertise of JGI and EMSL in an exploratory analysis of the transcriptome, proteome, and metabolome of host-specific endophytes to better understand their ecological functions. The results could transform the current paradigm of microbial community succession and function in litter and serve to explain a linkage between species diversity and major ecosystem processes, such as carbon cycling.