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Pore size effect on soil carbon dynamics during decomposition of switchgrass

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Soil pore size distribution (PSD) regulates oxygen diffusion and transport of water/mineralized nutrients. Microbial activity, which drives the carbon (C) cycle in the soil system, can react to these physical factors regulated by PSD. In this study, we investigated the contribution of PSD to C-related microbial activity during the switchgrass decomposition. We used two types of soils, which have controlled PSD (dominant pore size of < 10um and > 30 um). 13C labeled switchgrass leaf and root were incorporated into different PSD of soils and incubated for 21 days under 50% water-filled pore space. During the incubation, microbial activity was assessed with several indicators. i) Fate and transport of mineralized switchgrass, ii) Priming effect, iii) Spatial distribution of b-glucosidase and phenol oxidase, and iv) Microbial biomass. Our preliminary results showed that CO2 emission from switchgrass leaf was greater in the soil dominated by < 10 um pores. Higher b -glucosidase activity and mineralized C from switchgrass leaf supported greater C-related activity in such soil. However, interestingly, we observed a greater priming effect in the soil dominated by > 30 um pores. Due to the less mineralization and transport of switchgrass-derived C in such pores, enzymes targeting more complex substrate could be more active in such soil stimulating mineralization of native soil C. Our full results of phenol oxidase, microbial biomass, and more detailed analysis on 13C and C dynamics will help understanding how PSD can affect biochemical reactions in plant decomposition system.