Interactive Effects of Source Taxa and Charring Temperature on Black Carbon Stability and Reactivity in a Forest Soil

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ABSTRACT

Fire is a major mediator of carbon (C) and nitrogen (N) cycling in forests, releasing significant quantities of greenhouse gases, soot, and aerosols while simultaneously depositing black carbon (BC) onto forest soil. BC, the product of the incomplete combustion of biomass, makes up a significant portion of soil organic carbon (SOC) (~5 – 45%). The condensed aromatic structure of BC imparts a resistance to weathering and decay thus, BC can persist in soil for centuries to millennia - much higher than its unpyrolyzed source material. BC is also able to impact the turnover of soil organic C.

While many studies have linked BC production and source material to its biological reactivity, few studies have been able to determine the stability and reactivity of well-characterized BC, its effect on soil organic (SOC), or the effect of weathering of BC on its biological reactivity in field or laboratory decay studies. Addressing these knowledge gaps are particularly important as fire frequency and intensity are expected to increase in boreal and temperate ecosystems which are vulnerable to vegetation shifts and climate change. In this presentation, I will explore the interactive effects of source taxa and charring temperature on BC and SOC turnover as well as the effects of photo-oxidative weathering of BC on microbial and fungal response in soil and single – fungal culture laboratory incubation experiments. ^{13}C enriched BC were used to track the fate of BC through soil and culture medium. The results presented will inform on how BC physiochemical characteristics may be useful predictors in determining the relative stability and biological reactivity of BC in soil.