The Degradation Chemistry of Fungal Necromass and its Potential Contributions to Long-Lived Soil Carbon

KATHRYN M. SCHREINER,*[1] NEAL E. BLAIR[1] AND LOUISE EGERTON-WARBURTON[2]

[1]Department of Civil and Environmental Engineering, Northwestern University, Evanston, IL, (*correspondance kathryn.schreiner@northwestern.edu)
[2]Department of Civil and Environmental Engineering and Department of Earth and Planetary Sciences, Northwestern University, Evanston, IL (n-blair@northwestern.edu)
[3]Chicago Botanic Garden, Glencoe, IL (lwarburton@chicagobotanic.org)

Soil fungi are important degraders of the three most abundant biopolymers (cellulose, lignin, and chitin) and therefore they mediate a globally important flow of organic carbon (OC) in soils. However, relatively little is known about their contributions to long-lived soil carbon pools. We studied the degradation dynamics of fungal necromass in the common saprotrophic species *Fusarium aveneceum*. Fungal tissue was contained in stainless steel litterbags (pore size 100 μm) and degraded for two months in laboratory microcosms containing bulk soil replete with a natural soil microbial community. Approximately 75% of the original fungal OC was degraded in the first week, but after two months of degradation, 10-20% of the original OC was still present in the litterbags. Initial chemical analysis by FTIR spectroscopy and thermochemolysis-gas chromatography-mass spectrometry indicated that the chemistry of the fungal necromass changed significantly over the degradation sequence. Chitin (indicated by glucosamine) decayed rapidly, but an amide-rich residue remained and was concentrated in the residual tissue. Certain biomarker classes, such as fatty acids, displayed differing degradation characteristics. Some fatty acids, e.g. C_{16} and $C_{18:1}$, degraded faster than bulk OC while others, e.g. C_{18} and C_{24}, were concentrated in the residual tissue. The divergent degradation profiles have important implications for contributions and sources of free and bound lipid pools in soils and sediments. Similar patterns have been observed in a field incubation study of *Fusarium* tissue, thus validating the laboratory results. The results of this study point to an important contribution of fungi to the recalcitrant soil organic carbon pool.