



Modelling the fate of molecular structures in soils: from short-term decomposition to long-term C storage.

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Carbon from complex and structural plant molecules has long been considered more efficiently retained in soils than that of soluble molecules. This dominant paradigm is now being challenged by data emerging from recent isotopic-labeling and compound-specific isotopic studies. We recently demonstrated that large proportions of plant-residue lignin decompose within a year of incorporation to soils, and that soil-extracted lignin has a turnover time of about 20 years (Rasse et al, 2006). In contrast, turnover time of soil-extracted polysaccharides can reach 40 years (Gleixner et al., 2002). Long-term incubation studies have shown that C from labeled glucose is better conserved in certain soil types than C from more complex molecules such as cellulose (e.g. Vinten et al, 2002). These studies suggest that the initial decomposability of plant molecules has limited impact on the long-term fate of their constitutive C in soils. Here we will present a new model where soluble molecules have a competitive advantage over structural molecules for the long-term preservation of their constitutive C in soils. Implementation of compound-specific data in quantitative soil models will also be discussed.

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Vinten, A., Whitmore, Bloem, Howard, and Wright. 2002. Biology and Fertility of Soils 36:190-199.

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