Tree Species, Root Decomposition and Subsurface Denitrification Potential in Riparian Wetlands

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ABSTRACT

Patches of organic matter have been found to be important "hotspots" of denitrification in both surface and subsurface soils, but the factors controlling the formation and maintenance of these patches are not well established. We compared the concentration of patches of organic matter and root biomass in the subsurface (saturated zone) beneath poorly drained riparian wetland soils at four sites in Rhode Island, U.S.A. - two dominated by red maple *(Acer rubrum)* and two dominated by white pine *(Pinus strobus*). Denitrification enzyme activity (DEA) and carbon (C) content of patch material were compared between sites and between patches with different visual characteristics. Root decomposition was measured in an 8-week ex-situ incubation experiment that compared the effects of water content, root species, and soil matrix origin on CO_2 evolution. We observed significantly greater concentrations of patches at 55 cm at one red maple site than all other sites. DEA and percent C in patches was generally higher in patches than matrix soil and did not vary between sites or by patch type. White pine roots decomposed at a faster rate than red maple roots under unsaturated conditions. Our results suggest that faster root decomposition could result in lower concentrations of patches of organic material in subsurface soils at sites dominated by white pine. Tree species composition and root decomposition may play a significant role in the formation of patches and the creation and maintenance of groundwater denitrification hotspots in the subsurface of riparian wetlands.

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