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Leaf and root C-to-N ratios are poor predictors of soil microbial biomass C and respiration across 32 tree species

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Highlights

- CN ratio coordination in plants and soil and relation to soil microbes was studied.
- Across 32 tree species, we found weak coordination of C:N ratios among tissues.
- Root and soil CN ratios were coordinated but correlations were overall weak.
- Microbial biomass was related to soil CN ratio, but not to that of plant tissue.
- Soil stoichiometry is a better predictor for microbial biomass than that of plants.

Abstract

Soil microorganisms are the main primary decomposers of plant material and drive biogeochemical processes like carbon and nitrogen cycles. Hence, knowledge of their nutritional demands and limitations for activity and growth is of particular importance. However, potential effects of the stoichiometry of soil and plant species on soil microbial activity and carbon use efficiency are poorly understood. Soil properties and plant traits are assumed to drive microbial carbon and community structure. We investigated the associations between C and N concentrations of leaf, root, and soil as well as their ratios and soil microbial biomass C and activity (microbial basal respiration and specific respiratory quotient) across 32 young native angiosperm tree species at two locations in Central Germany. Correlations between C:N ratios of leaves, roots, and soil were positive but overall weak. Only regressions between root and leaf C:N ratios as well as between root and soil C:N ratios were significant at one site.

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