Shifts in Key Leaf Litter Traits Can Predict Effects of Plant Diversity Loss on Decomposition in Streams

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Plant biodiversity loss in riparian forests is known to alter key stream ecosystem processes such as leaf litter decomposition. One potential mechanism mediating this biodiversity?decomposition relationship is the increased variability of plant functional traits at higher levels of biodiversity, providing more varied resources for decomposers and thus improving their function. We explored this in a field experiment exposing litter from different assemblages with low or high trait variability (measured through phylogenetic distance, PD) to microbial decomposers and invertebrate detritivores within litterbags in a low-order stream. Litter assemblages generally lost less mass but more phosphorus (P) than expected from monocultures, and nitrogen (N) tended to increase in the absence of detritivores and decrease in their presence, with little effect of PD. In contrast, there were strong influences of mean values and variability of specific traits (mostly N, P and condensed tannins) on decomposition and on net diversity effects. The negative diversity effect on litter mass loss was mainly driven by negative complementarity (that is, physical or chemical interference among species or traits), although there was positive selection (that is, particular species or traits with large effects on decomposition) in high-PD assemblages with detritivores. High-PD assemblages tended to have more invertebrates and attracted more typical litter-consuming detritivores. Our study suggests that decomposition of litter assemblages is mainly driven by concentration and variability of several key litter traits, rather than overall trait heterogeneity

(measured through PD). However, differences in invertebrates colonizing high-PD and low-PD assemblages pointed to potential long-term effects of PD on decomposition.

complementarity effect

detritivores

ecosystem functioning

net diversity effect

riparian plants

selection effect