Long-term effects of riparian vegetation diversity on stream-dwelling microbes and litter decomposition

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Manipulations of plant litter diversity have been shown to affect litter decomposition and to alter the structure of aquatic assemblages. However, most experiments addressing biodiversity effects have been conducted at small temporal scales. Here, we used a pool of 3 common riparian plant species in Portugal (alder, oak and eucalyptus), to examine the potential long-term impacts of riparian diversity loss on litter decomposition and associated microbes. Fine-mesh bags containing mixtures of the 3 leaf species were immersed in a mixed-forested stream to allow microbial colonization. After 2 weeks, leaves were retrieved and placed in microcosms to simulate plant species loss. For that, all combinations of 1 to 3 non-colonized leaf species were enclosed in mesh containers and a set of colonized leaves was used as inoculum. This procedure was repeated each 30 days during 6 months keeping leaf species composition constant. In every 2 months, we assessed leaf mass loss, fungal biomass and microbial diversity by the number of operational taxonomic units (OTUs) from denaturing gradient gel electrophoresis, using primers targeting rDNA for bacteria, fungi and ciliates. The highest diversity on litter was found for bacteria (68 OTUs), followed by fungi (41 OTUs) and ciliates (31 OTUs). Litter decomposition, fungal biomass and the structure of microbial assemblages on each litter species varied along time. Fungal biomass and diversity of fungi and ciliates were affected by litter species diversity. After 6 months, fungal biomass on oak and eucalyptus was highest in mixtures with 3 litter species. Also fungal diversity on each litter species was highest in leaf mixtures, especially at longer times. Results suggest that changes in riparian vegetation, at longer time scales, can alter the structure of stream microbial assemblages and affect litter decomposition dynamics in streams.

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