

Eutrophication alters non-additive effects of plant-litter diversity in streams

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Litter decomposition is a key process in low-order forested streams that is affected by nutrient concentration in the stream water and diversity of riparian vegetation. However, the interactive effects of anthropogenic activities, such as eutrophication and loss of riparian vegetation, on plant litter decomposition are poorly understood.

Here, we tested if: i) plant litter decomposition depends on litter species diversity and/or quality; ii) putative diversity effects can be predicted by comparing decomposition of litter mixtures with that expected from the sum of individual litter species (additive model); iii) mixing low- and high-quality litter affects decomposition of individual species; and iv) eutrophication alters the observed patterns. We used leaves of five riparian tree species (*Alnus glutinosa*, *Castanea sativa*, *Eucalyptus globulus*, *Platanus* sp. and *Quercus robur*) either alone or in mixtures of 2, 3 and 5 species, in a total of 12 combinations. Leaves were weighed in 4g groups, placed in coarse-mesh bags, and immersed in low-order streams along a gradient of eutrophication for 38 days.

In the most oligotrophic stream, litter decomposition was significantly higher than that expected based on decomposition of individual litter species, indicating synergistic effects of litter mixtures. Moreover, the presence of high quality leaf species in mixtures increased the decomposition of low quality species. This trend tended to disappear with increasing levels of inorganic nutrients in the stream water. Results suggest that eutrophication can alter non-additive effects of riparian vegetation diversity on litter decomposition in streams.

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