

Topic: Climate Change

Plant-litter decomposition by microbes increases with temperature and nutrient load in streams

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We examined the interactive effects of temperature and inorganic nutrients on leaf decomposition and activity of the associated microbes in streams. Leaves of alder and oak were immersed for 10 d in a stream (NW Portugal) to allow microbial colonization, and then were exposed in microcosms to N-NO₃ (90-5000 µg/L; 6 levels) and P-PO₄ (3-300 µg/L; 3 levels), alone or in all possible combinations. One set of microcosms was kept at 12°C, a temperature typically found in autumn, and the other set at 18°C to simulate a warming scenario.

Leaf mass loss was higher for alder compared to oak, but fungal biomass was higher on oak leaves. This may be due to the transfer of fungal carbon from biomass into reproduction, because maximum fungal sporulation on alder leaves was one order of magnitude higher than on oak leaves. N immobilization in alder leaves was higher than in oak leaves and increased with N concentration and temperature in the stream water for both leaf types. Leaf mass loss and fungal biomass increased asymptotically with N concentration in the stream water (Michaelis-Menten kinetic), but P had no significant effect. For both leaf types, leaf decomposition and fungal biomass were higher at 18°C. The increase in temperature led to a decrease of the N concentration needed to achieve half of maximum fungal biomass and sporulation (km) on both leaf types, and km values were higher for oak than for alder leaves. This suggests that, under the predicted warming scenario, maximum fungal biomass and reproduction may be attained at lower nutrient concentrations, which may result in faster leaf decomposition in streams with lower nutrient levels. FEDER-POFC-COMPETE and FCT supported this study (PEst-C/BIA/UI4050/2011 and PTDC/CLI/67180/2006) and IF (SFRH/BD/42215/2007).