

Leaf litter decomposition dynamics in two beech forests stand on Italian Apennines: effects of litter quality, climatic and edaphic characteristics

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Litter decomposition is a critical process to function and integrity maintenance of all terrestrial ecosystems. The important ecological role is explicate mainly through the mineralization of organic matter, which returns the nutrients in inorganic form, but also through the formation of stable organic compounds in the soil. The decomposition is conditioned and regulated by a complex interaction of climate, litter quality and diversity of soil biota. The aim of this study was to compare, over about two years and within two Italian Apennines beech forests (Pradaccio, Tosco-Emiliano Apennines and Laceno, Campania Apennines), the leaf litter decomposition rates, the qualitative changes during decomposition, the activity of microbial communities and the litter microarthropod communities. Experimental protocol allowed to compare the two sites characterized by different climate regime and soil parental material (leaf litter incubated in their production sites using litterbags) and to test the effect of the site on the dynamics of decomposition regardless of the litter quality (leaf litter from Laceno incubated at Pradaccio and vice versa). The main results suggest: a) the decomposition constants k are higher for Laceno than for Pradaccio; b) at the early stage of the decomposition, the factor expressing 93% of the variance (two-way ANOVA) is “Plant Material”, whereas, subsequently, around 80% of the total variance is expressed by “Location” factor suggesting a greater involvement of climate, pH, microbial communities, soil fauna and other proprieties; c) cellulase and xylanase, enzymes involved in the degradation of holocellulose, show their highest activities between the first and second year of decomposition especially in the southern location, according to the higher decomposition trend recorded in Laceno; d) the activity of acid phosphomonoesterase, enzyme related to the phosphorus cycle, increase during time, particularly at Pradaccio, regardless of the litter involved; e) both laccase and peroxidase contribute to the degradation of lignin, but they are involved in different parts of the process and secreted by different fungi; f) also chitinase evidences the higher activity in Pradaccio than Laceno; g) among the nutrients, N and Mn play a substantial role in the decomposition process and are well related to the enzyme activities.

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