

Environmental controls of litter decomposition dynamics in Turkish forests

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Abstract: Concerns over the potential effects of increased atmospheric CO₂ have spurred research on topics as different in scale and process as plant leaf/litter quality and litter decomposition, global climatology and forest carbon storage. Decomposition is central to ecosystem functionality and recent studies have shown that decomposition in forest ecosystems contribute significantly to global carbon studies. Plant litter decomposition has long been recognized as an essential process for nutrient cycling and organic matter turnover within ecosystems that are important determinants of plant productivity and ecosystem carbon (C) storage. Decomposition rate and nutrient release patterns of plant litters are influenced by environmental conditions, the nature of the microorganisms and soil fauna active in the decomposition process, and by substrate quality or litter quality. In general, climate (especially temperature and moisture) governs decay rates on broad regional scales, whereas initial litter quality variables (carbon:nitrogen (C:N) ratio, lignin, N, and lignin:N ratio) are of more importance in controlling decay rates at small scales, i.e. within site. Interest in the role of litter decomposition in the global carbon cycle has increased recently since (1) increased atmospheric carbon dioxide will probably affect the chemical quality of litter (especially nitrogen content), and (2) global warming may enhance decomposition rates. In this present study, we have reviewed and discussed the four main site factors influencing litter decomposition dynamics in Turkish forests. In general, in Turkish forests, a number of site factors such as topographical landforms (especially different aspects and slope positions), gap size classes, stand type (pure or mixture) and understorey species can create different environmental conditions which can retard or accelerate litter decomposition through negative or positive effects on the activity of organisms. The results have generally indicated that the litters on north-facing site decomposed faster than those on the south-facing site. The litters placed at the top slope position decompose slower than at those at either the bottom or middle positions. Large forest gaps significantly reduce litter decomposition rates by changing environmental conditions, especially by decreasing soil temperature and soil pH which reduce soil respiration rates. Litter decomposition is highest under mixed beech/spruce forest, following by pure beech and spruce forest. Beech and spruce litter decompose much faster in mixed bags (beech–spruce) than they do separately under each stand type. Purple-flowered rhododendron significantly reduces litter decomposition of Oriental beech and spruce.

Keywords: Litter decomposition, Topography, Gap sizes, Stand types, Rhododendron, Site factors