forests

Editorial

Carbon and Nutrient Transfer via Above- and Below-Ground Litter in Forests

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Plants periodically shed more than 90% of their biomass production as above- and below-ground litter, including leaves, twigs, flowers, logs, roots and other tissues [1,2]. Litter production and decomposition are two of the most critical biogeochemical processes in transferring carbon and nutrients from plants back into the soil within forests. The returned litter components are the most important sources of soil organic matter and are crucial for maintaining soil fertility. Sequestering more carbon in forest soils by litter decomposition is currently a potential efficient strategy in serving "Carbon Neutrality". It is well-documented that, globally, land has been greening since the 1980s [3]. Consequently, litter production could inevitably increase with the increase in net productivity. However, attention has not been fully paid to the changes in litter quality and quantity, and the transfer processes of carbon and nutrients during litter production in forest ecosystems. Moreover, different forests could exhibit divergent responses in litter production to ongoing climate change. Up-to-date knowledge and theory are urgently needed.

To address this urgent topic, we aimed to collect different manuscripts that illustrate "Carbon and Nutrient Transfer via Above- and Below-ground Litter in Forests". A total of 15 high-quality articles were published after online peer review. The articles present topical examples of world-class research, including litterfall production, litter humification, litter quality, litter ^{13}C NMR spectroscopy components, nutrient return and resorption, the roles of soil fauna and microorganisms in litter decomposition, and any other related key points between litter and soil organic matter. We are delighted to present this book which is a compilation of these selected articles.

Here, we outline the key research activities and highlights of the publications included in this book. First of all, litter production is one of the primary nutrients returning processes in forest ecosystems. Yang et al. gave us a full picture of the production of total litterfall and its components (including leaves, twigs, reproductive organs and miscellaneous litterfall) from three cypress (*Cupressus funebris*) plantations with strip filling and ecological thinning [4]. Liu et al. investigated the seasonal and annual litterfall and calculated the returns of organic carbon, nitrogen, phosphorus, potassium, sulfur, calcium and magnesium in an evergreen broad-leaved forest [5]. Moreover, Hou et al. shed new light on the budget of plant litter and litter carbon in forest streams to check the biogeochemical linkages among mountain forests, riparian vegetation, and aquatic ecosystems [6]. Secondly, three of the articles addressed the initial litter quality and the changes in organic components during litter decomposition. Yang et al. used proximate analysis and ^{13}C nuclear magnetic resonance (NMR) with spectral editing techniques to quantify the variations in the initial C quality of newly shed foliar litter for fir, spruce, willow and rose over eight months in an alpine forest on the eastern Tibetan Plateau [7]. Liao et al. found that the content of acid hydrolysable components was 16%–21% in fresh litter across species, and only 4%–5% of these components remained in the litter after four years of decomposition when 53%–66%

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of litter mass was lost in an alpine forest [8]. Xu et al. measured tree fresh tissue-leached DOM quantity and biodegradability in the fresh leaves and twigs of two broadleaf trees and two coniferous trees in subtropical plantations [9]. Thirdly, environmental changes and decomposers including soil fauna and microorganisms play essential roles in litter humification and decomposition. Tan et al. observed that the contribution rates of soil fauna to the accumulation of humic substances were 109.06%, 71.48%, 11.22% and −44.43% for the litter of fir, cypress, birch and willow after one year of incubation in cold forests, respectively [10]. Wang et al. checked humus accumulations in five foliar litters during four years of decomposition and their responses to reduced snow cover in an alpine forest [11]. Guo et al. monitored the litter decomposition associated with microbial organisms using microbial phospholipid fatty acids (PLFAs) in the forest floor, headwater stream, and intermittent stream [12]. Li et al. assessed the potential seasonal effects of forest gaps on litter mass loss and carbon release from a four-year litterbag decomposition experiment along an elevation gradient (3000, 3300, and 3600 m) [13]. Wang et al. investigated the composition and diversity of soil microbial communities across a subalpine forest successional series on the eastern Qinghai–Tibet Plateau [14]. Fang et al. elucidated the changes in the community structure of soil fungi and bacteria as well as alteration in litter and soil chemical characteristics in Japanese cedar plantations experiencing the expansion of moso bamboo [15]. Additionally, Zhang et al. studied the monthly dynamics of leaf nitrogen (N) and phosphorus (P) resorption efficiencies and C:N:P stoichiometric ratios in two selected subtropical plantations during a growing season [16]. He et al. compared soil macronutrient stocks at soil depths of 0−20 and 20−40 cm across a chronosequence of Masson pine plantations [17]. McNabb and Startsev reported that the bulk density of the trafficked soil failed to recover after 7 years to a depth of 20 cm at nine boreal forest sites in Alberta, Canada [18].

In summary, the articles included in this book highlight the ecological importance of forest litter in nutrients cycling, soil carbon sequestrating, and soil organic matter forming. The results would be of great scientific value in improving forest services in the context of global climate change.

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