World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:11, No:05, 2017

Effects of Nitrogen Addition on Litter Decomposition and Nutrient Release in a Temperate Grassland in Northern China

Authors : Lili Yang, Jirui Gong, Qinpu Luo, Min Liu, Bo Yang, Zihe Zhang

Abstract : Anthropogenic activities have increased nitrogen (N) inputs to grassland ecosystems. Knowledge of the impact of N addition on litter decomposition is critical to understand ecosystem carbon cycling and their responses to global climate change. The aim of this study was to investigate the effects of N addition and litter types on litter decomposition of a semi-arid temperate grassland during growing and non-growing seasons in Inner Mongolia, northern China, and to identify the relation between litter decomposition and C: N: P stoichiometry in the litter-soil continuum. Six levels of N addition were conducted: CK, N1 (0 g Nm−2 yr−1), N2 (2 g Nm−2 yr−1), N3 (5 g Nm−2 yr−1), N4 (10 g Nm−2 yr−1) and N5 (25 g Nm−2 yr−1). Litter decomposition rates and nutrient release differed greatly among N addition gradients and litter types. N addition promoted litter decomposition of S. grandis, but exhibited no significant influence on L. chinensis litter, indicating that the S. grandis litter decomposition was more sensitive to N addition than L. chinensis. The critical threshold for N addition to promote mixed litter decomposition was 10 -25g Nm−2 yr−1. N addition altered the balance of C: N: P stoichiometry between litter, soil and microbial biomass. During decomposition progress, the L. chinensis litter N: P was higher in N2-N4 plots compared to CK, while the S. grandis litter C: N was lower in N3 and N4 plots, indicating that litter N or P content doesn't satisfy microbial decomposers with the increasing of N addition. As a result, S. grandis litter exhibited net N immobilization, while L. chinensis litter net P immobilization. Mixed litter C: N: P stoichiometry satisfied the demand of microbial decomposers, showed net mineralization during the decomposition process. With the increasing N deposition in the future, mixed litter would potentially promote C and nutrient cycling in grassland ecosystem by increasing litter decomposition and nutrient release.

Keywords : C: N: P stoichiometry, litter decomposition, nitrogen addition, nutrient release
Conference Title : ICEEBS 2017 : International Conference on Ecological, Environmental and Biological Sciences
Conference Location : Montreal, Canada
Conference Dates : May 11-12, 2017