Nitrogen dynamics with litter decomposition of Sasa dwarf bamboo and tree in forest ecosystem of northern Hokkaido

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The quantity and quality of litterfall relates to soil formation and the maintenance of soil fertility. Plant litter decomposition relates to production of soil organic matter associated with nutrients (eg. nitrogen and phosphorus) and retention of carbon and nutrients. In biogeochemical cycling of forest ecosystem, nitrogen is essential nutrient for tree. For this reason, many studies have reported that the change of nitrogen cycling in forest ecosystem affect nutrient availability between soil and plant. In litter decomposition studies, rate of litter decomposition and nutrient dynamics were limited by the initial nitrogen contents in litter.

This study conducted at Nakagawa Experimental forest of Hokkaido University located in northern Japan. The Nakagawa Experimental forest is cool - temperate natural forest dominated by birch*(Betula ermanii)* and maple *(Acer mono)* and Sachalin Fir*(Abies Sachalinensis)*). The understory vegetation is dominated by Sasa dwarf bamboo*(Sasa senanensis)*.Litter decomposition experiment was conducted using a litterbag method. We categorized litterbag into three types that were Sasa leaf, Sasa culm, tree leaf (Nov. 2005 - Nov. 2007). We also utilize the litter from nitrogen treatment site (50 kgN ha^{-1} y^{-1} from 2001) to discuss the effect of initial nitrogen content in litter on the decomposition process.

The rate of litter decomposition in sasa leaf was slower than that in tree leaf although the .initial nitrogen contents of Sasa leaf was almost same to that in tree leaf. Initial nitrogen contents of Sasa leaf and culm was significantly different each other but rate of litter decomposition was almost comparable. Amount of returned nitrogen to litter layer by litterfall at Sasa litter and tree leaf litter was 1.5, 3.0 gN m^{-2} y^{-1}, respectively. After the two years, the amount of retained nitrogen in the litter of Sasa and tree was 1.3, 3.0 gN m^{-2}, respectively, indicating that the almost 100 % of amount of returned nitrogen by litterfall was retained in litter during two years. This result show that available nitrogen for tree is not released during the litter decomposition, while the litter have an important function of nitrogen retention.

The higher content of nitrogen in the initial litter increased the decomposition rate for tree leaf. However, the difference of the decomposition rate between Sasa and tree was not explained only by the differences of the initial nitrogen content, suggesting that the other factor affected their differences.

Through the decomposition process in two years, nitrogen contents of all litter types increased with litter mass loss. We represented the relation between litter mass loss and increasing nitrogen contents with litter mass loss and defined slope of the regression line as nitrogen contents increase rate (NCIR). The relation between litter mass loss ratio in each year and NCIR showed positive correlation in first year, whereas the relation showed negative correlation in second year. The remaining ratio of carbon in litter of Sasa and tree after two years was 51 and 36 %, respectively. It was indicated that the litter decomposition period in Sasa litter with low NCIR would be longer than in tree leaf litter with high NCIR, suggesting that the difference of NCIR strongly related to the differences of the decomposition period of Sasa and tree leaf litter.