

季节性冻融期间土壤动物对岷江冷杉凋落叶质量损失的贡献

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摘要 冬季凋落物的质量损失是中高纬度和高海拔地区凋落物分解的关键, 但冬季凋落物分解是否与土壤动物的贡献有关, 不同冻融时期(冻融初期、深冻期和融化期)的土壤动物对凋落物分解的贡献是否存在差异? 对这两个问题仍缺乏必要的关注。为了解季节性冻融期间土壤动物对岷江冷杉(*Abies faxoniana*)凋落物分解的贡献, 采用凋落物分解袋法, 调查了季节性冻融期间(2010年10月底至2011年4月中旬), 不同网孔(0.020 mm、0.125 mm、1.000 mm和3.000 mm)凋落物分解袋内的岷江冷杉凋落叶质量损失, 分析了微型、中型和大型土壤动物对岷江冷杉凋落叶分解的贡献。在季节性冻融期间, 0.020 mm、0.125 mm、1.000 mm和3.000 mm分解袋内的岷江冷杉凋落叶质量损失率分别为12.13%、13.07%、14.95%和18.74%。不同体径的土壤动物对季节性冻融期间岷江冷杉凋落叶质量损失的贡献率总共为35.28%; 不同孔径凋落物袋内土壤动物的类群和个体相对密度与凋落叶的质量损失率呈现相对一致的变化趋势。在季节性冻融的3个阶段中, 土壤动物对岷江冷杉凋落叶质量损失的贡献率均为: 微型土壤动物<中型土壤动物<大型土壤动物。其中, 微型、中型和大型土壤动物分别在深冻期、冻融初期和融化期表现出最高的贡献率, 分别为6.56%、11.77%和21.94%。然而相对于其他冻融时期, 深冻期中型和大型土壤动物对岷江冷杉凋落叶质量损失的贡献率最低。这些结果清晰地表明了川西高山季节性冻融期间土壤动物调控着凋落物分解的生态过程, 是高山冬季凋落物分解的重要因素之一。

关键词: 岷江冷杉凋落叶 高山森林 季节性冻融 质量损失 土壤动物

Abstract: *Aims* Mass loss in wintertime is one of the key processes in litter decomposition in cold biomes. The contribution of soil fauna to litter decomposition has been unclear, and the contribution might be different in different winter periods (OF: the onset of the freeze-thaw season, DF: the deep frozen period and TS: the thawing stage). The objective was therefore to quantify the contributions of soil fauna to fir (*Abies faxoniana*) leaf litter decomposition during the freeze-thaw season.

Methods A field experiment using litterbags was conducted in an alpine fir forest from October 2010 to April 2011. Samples of air-dried fir leaf litter were placed in nylon litterbags (20 cm × 20 cm, 10 g per bag), and the edges were sealed. We investigated mass loss rates in litterbags with different mesh sizes (0.020, 0.125, 1.000 and 3.000 mm) and simultaneously analyzed contributions of micro-, meso- and macro-fauna to leaf litter decomposition.

Important findings Over the freeze-thaw season, the mass loss rates in litterbags with different mesh sizes were 12.13% (0.020 mm), 13.07% (0.125 mm), 14.95% (1.000 mm) and 18.74% (3.000 mm). Contribution percentages of all three body-size soil faunas were about 35.28%. Mass loss rates of fir leaf litter appeared consistent with the taxa and individual relative density of soil fauna. Contribution percentages of mass loss rates showed the order as micro- < meso- < macro-fauna during the three stages of the freeze-thaw season. The highest contribution percentages of micro-fauna (6.56%), meso-fauna (11.77%) and macro-fauna (21.94%) were detected at DF, OF and TS stage, respectively. However, the contribution percentages of meso- and macro-fauna during the DF stage were lower than the other two stages. The results demonstrated that soil fauna played an important role in litter decomposition during the freeze-thaw season in alpine forests of western China.

Keywords: *Abies faxoniana* leaf litter, alpine forest, freeze-thaw season, mass loss, soil fauna

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