

研究报告

杉木人工林土壤微生物生物量碳氮特征及其与土壤养分的关系

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摘要 研究了湖南会同红黄壤区杉木人工林和常绿阔叶林土壤微生物量和养分状况. 结果表明, 该区杉木人工林取代地带性常绿阔叶林和杉木连栽后, 土壤微生物碳、氮和土壤养分含量下降, 土壤严重退化. 在0~10 cm土层内, 常绿阔叶林土壤微生物碳和氮含量为800.5和84.5 mg·kg⁻¹, 分别是第1代杉木林的1.90和1.03倍、第2代杉木林的2.16和1.27倍; 在10~20 cm土层内, 常绿阔叶林土壤微生物碳和氮含量为475.4和63.3 mg·kg⁻¹, 分别是第1代杉木纯林的1.86、1.60倍和第2代杉木林的2.11和1.76倍. 在0~10 cm 和10~20cm土层内, 杉木人工林取代常绿阔叶林和杉木栽植代数增加后, 土壤全氮、全钾、铵态氮和速效钾含量均明显降低, 但差异并不显著. 人工杉木林分组成单一, 其凋落物分解慢、归还养分数量少; 炼山等造成的表土流失是杉木人工林土壤微生物量和养分库退化的重要原因. 土壤微生物碳与土壤全氮、铵态氮、全钾和速效钾含量呈极显著的正相关, 土壤微生物氮与土壤养分含量也达到极显著水平.

关键词 [杉木人工林](#) [常绿阔叶林](#) [土壤微生物量](#) [土壤肥力](#)

分类号

Characteristics of soil microbial biomass carbon and nitrogen and their relationships with soil nutrients in *Cunninghamia lanceolata* plantations

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Abstract

The study on the soil microbial biomass and nutrient status under native broadleaved forest and *Cunninghamia lanceolata* plantations at the Huitong

National Research Station of Forest Ecosystem showed that after the native broadleaved forest was replaced by mono-cultured *C. lanceolata* or *C. lanceolata* was planted continuously, soil microbial biomass and nutrient pool decreased greatly. In 0~10 cm soil layer, the concentrations of soil microbial carbon and nitrogen in broadleaved forest were 800.5 and 84.5 mg·kg⁻¹, being 1.90 and 1.03 times as much as those in the first rotation of *C. lanceolata* plantation, and 2.16 and 1.27 times as much as those in the second rotation of the plantation, respectively, while in 10~20 cm soil layer, the microbial carbon and nitrogen in broadleaved forest were 475.4 and 63.3 mg·kg⁻¹, being 1.86 and 1.60 times as much as those in the first rotation, and 2.11 and 1.76 times as much as those in the second rotation, respectively. Soil nutrient pools such as total nitrogen, total potassium, NH₄⁺-N, and available potassium also declined after the *C. lanceolata* plantation replaced native broadleaved forest, or *C. lanceolata* was planted continuously. Less litter and its slower decay rate in pure *C. lanceolata* plantation were the crucial factors leading to the decrease of soil microbial biomass and nutrient pool in this area, and human disturbance, especially slash-burning and site preparation, was the another factor leading to the decrease. There were significant positive correlations between soil

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microbial carbon and nitrogen and soil nutrients. To improve soil quality and maintain sustainable productivity, some measures including planting mixed conifer with hardwood, preserving residues after harvest, and adopting scientific site preparation should be taken.

Key words [Cunninghamia lanceolata plantation](#) [Evergreen broadleaved forest](#) [Soil microbial biomass](#) [Soil fertility](#)

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