

研究论文

热带亚热带常绿阔叶林维持酸性土壤有效磷水平的磷转化过程

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摘要 热带和亚热带酸性土壤磷矿物的沉淀通常被认为会限制土壤有效磷的供应。选择以西双版纳山地季风常绿阔叶林和哀牢山中山湿性常绿阔叶林为代表的热带亚热带酸性土壤, 探讨两类森林维持土壤有效磷水平的磷转化过程。哀牢山中山湿性常绿阔叶林腐殖质厚, 而西双版纳山地季风常绿阔叶林的腐殖质几乎不存在。两地均显示土壤有效磷库随着土壤有机质含量的减少而降低。有机质含量较低的两版纳表层矿质土(0~10 cm)的微生物生物量磷库大于有机质含量相对较高的哀牢山表层矿质土的微生物生物量磷库, 且微生物对磷的固定占有有效磷来源(磷矿物的溶解和有机磷的矿化)的比例为74%, 高于哀牢山表层矿质土的63%。哀牢山表层矿质土的土壤有效磷库大于西双版纳, 其土壤有效磷库可能更多的依赖于覆盖于其上的腐殖质分解后向下的磷输入。与两地的矿质土相比, 哀牢山腐殖质具有高的磷净溶解率、总有机磷矿化速率和磷微生物固定速率。结果表明, 热带山地季风常绿阔叶林主要通过微生物固定来避免土壤磷矿物的沉淀和保持土壤磷的有效供应; 而亚热带中山湿性常绿阔叶林除具有较高的微生物固定外, 地表腐殖质层的存在也帮助避免土壤磷矿物的沉淀而保持土壤有效磷的供应。

关键词 [磷生物地球化学](#); [磷库](#); [磷矿化](#); [磷微生物固定](#); [哀牢山](#); [西双版纳](#)

分类号

Retention of plant available P in acid soils of tropical and subtropical evergreen broad-leaved forests

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Abstract Mineral phosphate precipitation is often recognized to limit the availability of phosphorus in acid soils of tropical and subtropical forests. We studied extractable phosphorus pools and transformation rates in soils of a tropical evergreen forest at Xishuangbanna and a subtropical montane wet forest at the Ailao Mountains in order to understand biogeochemical processes that regulate phosphorus availability in acid soils. The two forests differ in forest floor-mass with a deep humus layer in the Ailao forest and little presence of humus materials in the Xishuangbanna forest. Resin and sodium-bicarbonate extractable phosphorus pools decreased when soil organic carbon content was low. The lowest levels of extractable P pools occurred in surface (0~10 cm) mineral soils of the Xishuangbanna forest. However, microbial P in the mineral soil of the Xishuangbanna forest was twice that in the Ailao forest. Potential rates of microbial P immobilization were greater than those of organic P mineralization in mineral soils for both forests. Our data suggest that microbial P immobilization plays an essential role in avoiding mineral P precipitation and retain plant available P in tropical acid soils, whereas both floor mass accumulation and microbial P immobilization function to retain plant available P in subtropical montane wet forests.

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