

粤西地区 4 种典型人工林土壤碳、氮、磷垂直分布特征

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摘要:【目的】土壤碳(C)、氮(N)、磷(P)生态化学计量比是反映森林生态系统养分变化的重要指标。研究旨在探明粤西地区不同林分类型的土壤 C、N、P 养分的垂直分布特征及其与化学计量特征之间的关系。【方法】以广东省阳江市国有花滩林场的马占相思 *Acacia mangium*、加勒比松 *Pinus caribaea*、尾叶桉 *Eucalyptus urophylla* 和灰木莲 *Magnoliaceae glanca* 四种典型人工林为研究对象, 对 4 种人工林 100 cm 深度的 5 个不同土层(0~10 cm、10~20 cm、20~40 cm、40~60 cm、60~100 cm)的土壤总有机碳(TOC)、全氮(TN)、全磷(TP)和速效磷(AP)等指标进行测定, 探讨不同人工林类型土壤 C、N、P 的垂直变化及其化学计量特征。【结果】不同林分类型和土层深度的土壤 TOC、TN 存在显著差异, 土壤 TOC 和 TN 含量随着土层深度的增加而减少, 在不同林分间表现为马占相思>加勒比松>尾叶桉>灰木莲, 土壤 TP 在不同林分类型和土层深度间的含量相对比较稳定。马占相思林、加勒比松林、尾叶桉林和灰木莲林的土壤 C:N、C:P、N:P 分别为 7.45~8.09、10.14~16.59 和 1.35~2.18, 均低于全国土壤平均水平。相关性分析结果表明, 4 种林分的土壤 TOC 与 TN、C:N 与 C:P 均呈极显著正相关关系, 土壤含水量(SWC)和 pH 值会影响土壤 C、N、P 含量以及生态化学计量学特征。【结论】马占相思林有较好的养分归还和地力维持的效果, 在人工林营建过程中, 可以通过适当种植固氮树种达到土壤肥力改良的目的。

关键词: 林分类型; 化学计量比; 土壤养分; 垂直分布; 固氮树种; 人工林

Vertical distribution characteristics of soil carbon, nitrogen and phosphorus nutrients in four typical plantations in western Guangdong

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Abstract: 【Objective】 Ecological stoichiometric ratio of soil carbon (C), nitrogen (N) and phosphorus (P) was an important index to reflect the nutrients change in forest ecosystem. The purpose of this paper was to explore the vertical distribution characteristics of soil C, N and P nutrients of different plantation types in western Guangdong and their correlation with stoichiometric characteristics. 【Method】 Four typical plantations of state-owned Huatan forest farm in Yangjiang city, Guangdong province were selected. Taking *Acacia mangium*, *Pinus caribaea*, *Eucalyptus urophylla* and *Magnoliaceae glance* as research objects, this study explored soil TOC, TN, TP and AP in five different soil layers (0-10 cm, 10-20 cm, 20-40 cm, 40-60 cm, 60-100 cm) at 100 cm depth of four plantations, and the vertical variation and stoichiometric characteristics of soil C, N and P in the planation were discussed. 【Result】 There were significant differences in TOC and TN contents among different plantation types and soil depth. TOC and TN contents decreased with the increased of soil depth, and the contents of TOC and TN in soil were as followed: *A. mangium* > *P. caribaea* > *E. urophylla* > *M. glance*. The contents of TP were relatively stable among different

stand types and soil depth. The soil C : N, C : P, N : P of *A. mangium*, *P. caribaea*, *E. urophylla* and *M. glance* were 7.45-8.09, 10.14-16.59, and 1.35-2.18, respectively, which were all lower than the national average. The correlation analysis showed that soil TOC were significantly positively correlated with TN, C : N and C : P, and soil SWC and pH affected soil C,N and P contents as well as ecological stoichiometric characteristics. 【Conclusion】 The plantation of *A. mangium* has better soil nutrient return and fertility maintain ability. In the process of plantation construction, soil fertility improvement can be achieved by proper planting of nitrogen-fixing trees.

Keywords: stand type; stoichiometry; soil nutrient; vertical distribution; nitrogen-fixing trees; plantation.