

# Soil microbial distribution pattern and their ecological linkage with plant diversity along a 2500 km forest latitudinal gradient

Yuguang Zhang<sup>1</sup>, Jing Cong<sup>2</sup>, Yuyu Sheng<sup>3</sup>, Hui Lu<sup>2</sup>, Kai Feng<sup>4</sup>, Guanglinag Li<sup>3</sup>, Diqiang Li<sup>1</sup>, and Ye Deng<sup>5</sup>

<sup>1</sup>Chinese Academy of Forestry Institute of Forest Ecology Environment and Protection

<sup>2</sup>Institute of Forestry Ecology, the Chinese Academy of Forestry

<sup>3</sup>Affiliation not available

<sup>4</sup>Key Laboratory of Environmental Biotechnology of CAS

<sup>5</sup>Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences

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## Abstract

Soil microbial diversity distribution patterns and their ecological linkage with aboveground plant diversity are essential for both theoretical and applied ecology. However, a number of studies have shown soil microbial distribution patterns along different environmental gradients are inconsistent and their ecological linkages with plant diversity haven't been well clarified. In this study, the plant and soil microbial diversity was simultaneously surveyed in 30 natural broadleaved forest sites along a 2500 km latitudinal gradient (18°–40°N) in China. The soil bacterial and fungal diversity was detected using the Illumina sequencing technique. The results showed soil bacterial and fungal community structure differed significantly among different sites and their alpha-diversity significantly increased as latitudinal increased ( $P < 0.001$ ), and the plant and soil microbial beta-diversity was significantly linkages ( $P < 0.001$ ). Based on the partial Mantel test, boosted regression tree and structural equation model analysis, we found plant alpha-diversity had no positive correlation with soil microbial alpha-diversity, and soil pH and climate condition (including mean annual precipitation and mean annual temperature) were the most important factors affecting soil microbial community structure. However, soil microbial heterogeneity might significantly affect aboveground plant community structure. Our analysis indicated that the plant beta-diversity could predict soil microbial beta-diversity at regional forest system, and soil pH plays higher roles than plant diversity in affecting soil microbial community at regional scale. This study provides new insights into the soil microbial diversity distribution patterns and ecological linkage between plant diversity and soil microbial diversity in natural forest ecosystem at the regional scale.

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