Large-scale structure, composition, and diversity of soil bacterial and fungal communities in ancient tea plantations

Guisheng Xiang¹, Zijun Wang¹, Guorong Li², Dawei Li¹, Jing Yan¹, Shuang Ye¹, Chunping Wang¹, Ling Yang¹, Shiyu Zhang¹, Shuangyan Zhang¹, Ling Zhou¹, Heng Gui³, Jianchu Xu³, Wei Chen¹, Jun Sheng¹, and Yang Dong¹

¹Yunnan Agricultural University

²Lincang Tea Research Institute

³Kunming Institute of Botany Chinese Academy of Sciences

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Abstract

The ecosystem of tea plantations portrays a special interaction among environment, soil microorganisms and tea trees. Under the influence of environmental factors and human management, the growth, quality, yield of tea trees and the tea leaves may also be dependent upon the changes in the soil microbial community. However, little is known about the composition and structure of soil bacterial and fungal communities in hundred-year-old tea plantations and the mechanisms by which they are affected. In this regard, we characterized the microbiome of tea plantation soils by considering the bacterial and fungal communities in 448 soil samples from 101 ancient tea plantations in eight counties of Lincang city, which is one of domestication centers of tea trees in the world. We applied 16S and ITS rRNA high-throughput sequencing techniques, and found that the effect of pH and altitude changes on the relative abundance of fungal communities was more pronounced than that on bacteria. In terms of the influence of pH and altitude on soil microbial communities, the abundance and diversity of bacterial communities were more sensitive to pH than those of fungi. The α -diversity of bacterial communities peaked in the pH 4.50-5.00 and altitude 2,200 m group, and the highest α -diversity of fungi showed in the pH 5.00-5.50 and 900 m group. While all microbes varied similarly changing with environment and geographies, and further correlations were found that the composition and structure of bacterial communities were more sensitive to latitude and altitude than that of fungal communities.

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