

Grassland use impacts on soil properties and microbial communities: A case study from the Qinghai-Tibetan plateau

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Abstract

Different grazing practices can have varying impacts on soil properties and soil microbial communities, which are critical for maintaining productivity and functions of grasslands and the overall ecosystem. The Qinghai-Tibetan plateau (QTP) is the largest high-altitude grazing region on earth, and has three different grazing practices, including seasonal grazing (SG), continuous grazing (CG), and exclosure grazing (EG) for 10 years. Vegetation, soil properties from two different depths (0-0.15 and 0.15-0.30 m) and soil microbial communities in the surface soil layer (0-0.15 m) were measured in triplicate plots within each grazing practice. The soil conditions in the SG site were the best, the CG site was the worst, while the EG site was intermediate. Dry aboveground biomass, soil organic carbon, total nitrogen, and total phosphorus content under SG were 838 g/m², 20.73g/kg, 1.74 g/kg, and 0.20 g/kg, respectively, and under CG were 8.80 g/m², 8.07g/kg, 1.07 g/kg, 0.16 g/kg, respectively. There was no significant difference in the α -diversity of soil bacteria and fungi among the three grazing practices. However, the bacterial communities were significantly different from each other; only the fungal community under EG was significantly different from the other grazing practices. While the relative abundance of Basidiomycota under SG was significantly higher than that under EG, no difference was observed in the relative abundance of Ascomycota, Zygomycota, and unclassified_k.Fungi among the three grazing practices. Compared to SG, CG and EG significantly increased the relative abundance of Actinobacteria, Gemmatimonadetes, Verrucomicrobia, and Nitrospirae, but decreased the relative abundance of Proteobacteria and Bacteroidetes.

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