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宁南山区两种灌木林土壤矿化过程中PLFA指纹季节变化特征

Seasonal variation of PLFA during soil mineralization under two kinds of shrub lands in mountainous area of southern Ningxia, Northwest China

关键词: [灌木类型](#) [土壤矿化原位培养](#) [磷脂脂肪酸](#) [季节变化](#) [宁南山区](#)

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摘要: 研究土壤矿化过程中土壤微生物群落结构的变化特征,对深入理解土壤中物质转化和养分迁移机理、提高土壤质量具有重要意义.因此,本文以宁南山区典型的两种人工灌木林-柠条和山桃林地土壤为研究对象,采用PVC顶盖埋管法进行1年的原位矿化实验,每隔2个月采样测定土壤基本理化性质和磷脂脂肪酸(Phospholipid fatty acid, PLFA)含量,探讨土壤在矿化过程中微生物群落结构的变化特征.结果显示:土壤矿化过程中,柠条林地土壤有机碳、全氮、硝态氮、铵态氮和土壤含水率显著高于山桃林地($p<0.05$);两种灌木林地有机碳含量在矿化240 d和360 d时较低,显著小于其他矿化时期($p<0.05$),硝态氮、铵态氮含量均在矿化240 d时最低,全氮和土壤pH随时间变化不显著.柠条林土壤各菌群PLFA含量高于山桃林土壤;两种土壤各菌群PLFA随矿化时间大体呈现出夏季>春、秋季>冬季的趋势,且差异显著($p<0.05$);土壤细菌与真菌、革兰氏阳性(GP)和阴性菌(GN)的PLFA比值差异显著($p<0.05$),柠条林土壤细菌与真菌PLFA比值随矿化时间呈现出夏、秋季>春、冬季的趋势,而山桃林土壤细菌与真菌PLFA比值在冬季最低,两种土壤革兰氏阳性和阴性菌PLFA比值在春季最大.PLFA主成分分析表明,柠条和山桃林土壤微生物群落结构不同,并且土壤微生物群落结构随矿化时间逐步发生变异,微生物结构的变化主要由以16:0,16:1 ω 9c,16:1 ω 9t,17:0,10Me18:0和cy19:0所代表的细菌及以18:2 ω 9,12c所代表的真菌的变化引起.土壤微生物PLFA与土壤有机碳、硝态氮和土壤含水率显著相关,与土壤pH值不相关,说明土壤微生物PLFA与土壤理化性质联系紧密.

Abstract: Understanding the characteristics of soil microbial community structure in soil mineralization process is very crucial for further identification of the mechanism of the nutrient transport and transformation and for improvement of soil quality. Two typical artificial shrub lands *Caragana korshinskii* and *Prunus davidiana* in a mountainous area of southern Ningxia were selected. In this study, soil mineralization process in a year was examined by the methods of in situ closed-top PVC tube incubation. The basic soil physicochemical properties and microbial phospholipid fatty acid (PLFA) were measured in order to explore the different soil microbial community structures in the two typical artificial shrub lands in the soil mineralization process. The results displayed that the soil organic C, total N, nitrate N, ammonium N content and soil moisture of the *Caragana korshinskii* land was significantly higher than those of the *Prunus davidiana* land during the soil mineralization. The soil organic C content of both types of shrub lands were significantly less than the other mineralization period in 240 d and 360 d ($p<0.05$), while the nitrate N and ammonium N content were the lowest when it was 240 d, but total N and soil pH did not significantly changed over time. The microorganism PLFAs content in the *Caragana korshinskii* land were higher than those in the *Prunus davidiana* land. The soil microbial PLFA content of two soils was the highest in summer, followed by spring, autumn, and winter ($p<0.05$). The soil had significant difference on the ratio of soil bacteria to fungi and the ratio of soil gram positive bacteria (GP) to gram negative bacteria (GN) ($p<0.05$). The ratio of soil bacteria to fungi of *Caragana korshinskii* in summer and autumn was higher than that in spring and winter, but the ratio of soil bacteria to fungi of *Prunus davidiana* was the lowest in winter. Both ratios of GP/GN of two soils was the highest in spring. In addition, principal components analysis (PCA) revealed that microbial community structure was significantly influenced by shrub types and deposition time. Meanwhile, changes of microbial community structure were mainly caused by the changes of bacteria with 16:0,16:1 ω 9c,16:1 ω 9t,17:0,10Me18:0,cy19:0 and fungi with 18:2 ω 9,12c. The soil microbial biomass was correlated with soil organic C, nitrate N and soil moisture, but correlation with the soil pH. This showed that the

physical and chemical properties of soil were closely associated with the soil microbial community structures.

Key words: [shrub type](#) [soil in situ incubation mineralization](#) [phospholipid fatty acid](#) [seasonal variation](#) [mountainous area of southern Ningxia](#)

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