

5.碳氮过程与可持续发展

Driving factors for soil C:N ratio in woody plant communities across northeastern Qinghai-Tibetan Plateau

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摘要: Soil carbon: nitrogen ratio (Soil C:N ratio) is a crucial and stable indicator of soil organic matter quality, but little is known about how it is driven in woody plant communities on the northeastern Qinghai-Tibetan Plateau (QTP). For addressing the gap, we sampled 92 tree field plots and 200 shrub field plots during the plants' growing seasons based on Vegetation Map of the People's Republic of China (1:1,000,000) to investigate the vegetations and soils. Our results showed that soil C:N ratios in tree communities were higher than those in shrub communities, with values of 14.58 ± 1.85 and 13.16 ± 1.66 , respectively. Random forest (RF) algorithm and multiple comparison analysis further suggested that soil C:N ratios varied significantly among lifeforms and community types. Interestingly, our findings challenged the long-held view that climate had the most important impact on soil C:N ratios at the regional scale, as the hierarchy of importance for integrated factors was found to be soil > topography > biology > climate > lifeform for all woody plants. Pearson correlation analysis and ordinary least squares (OLS) regression analysis revealed that dissolved organic nitrogen (DON), ectomycorrhizal fungi (EcM) species proportion and downward shortwave radiation (Shwara) had significant positive correlations with soil C:N ratios in both lifeforms. The variation partitioning analyses (VPA) results showed that edaphic properties solely explained most of the variance. Multiple linear regression (MLR) models exhibited that dissolved total nitrogen (DTN) and DON were the main attributes influencing soil C:N ratios in tree communities while DON had the largest positive effect in shrub communities. Overall, these findings provide new insights into the regulatory mechanisms of C and N cycling in the woody plant communities of the northeastern QTP and shed light on the controlling factors of soil C:N ratios in this region.

关键词: Soil C:N ratio; Edaphic factors; Climatic factors; Biotic factors; Topographic factors