The relative importance of climatic and edaphic factors as drivers of plant (L.chinensis) 15N in China's temperate grasslands

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Abstract

Many studies have showed that climatic and edaphic variables influence the variations of nitrogen isotopes in terrestrial ecosystems. However, the relative importance of climate and soil variables on plant ?15N remains unclear, which limits the understanding mechanism of plant ?15N variation. In this study, the ?15N values of Leymus chinensis (a widespread species) and the corresponding climate and soil variables were investigated from 40 sampling sites in temperate grasslands of northern China. We disentangled and estimated the influences of climatic and edaphic variables on plant ?15N through the variable importance in projection (VIP) technology based on partial least squares-regression (PLS) analysis. Results showed that the 8 variables can explain 69%˜87% of the variance of plant ?15N along the transect, and climatic factors contributed more than edaphic factors (41% vs. 37%). Among the climatic variables, MAP was the most important control variable, which explained approximately 25% of the variation in plant ?15N, followed by MAT. As for edaphic factors, soil N had the most significant effect on plant 15N abundance, and its relative contribution was about 15%, followed by SWC and soil δ15N. The relative influences of other variables such as MARH, soil pH and C/N ratios were less important in determining plant δ15N. In addition, a high-performance model for predicting plant δ15N was built by the VIP screening method. Further research should focus on the interaction of climate and soil variables on different scale patterns of nitrogen isotope.

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