

Ecological stoichiometry of plant-litter-soil and stoichiometric homeostasis of plant tissues under three restoration modes for desertified grasslands in southern Horqin Sandy Land, Northern China

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Abstract

Afforestation is the primary ecosystem measure to address the issue of ecosystem degradation in the Horqin sandy region of northern China. However, it is yet unclear how afforestation may affect the recovery of sandy grassland. This study took the ecological stoichiometry as indicators, and conducted a field investigation and indoor analysis to assess the afforestation strategies of three indigenous tree species for the restoration of sandy grassland, three restoration strategies were: (1) grasslands were enclosed via a *Populus × beijingensis* shelterbelt (FG); (2) *Pinussylvestris var. mongolica* was used for the afforestation of small, well-distributed grassland patches (MG); (3) *Ulmus pumila* was used for the afforestation of small, well-distributed patches (UG). Our result showed that the C, N, and P contents as well as the C: N: P ratio in plants, litters, and soils varied significantly between FG, MG, and UG. All three treatments were found to significantly impact the soil ratios of C:N, N:P, and C:P relative to CK treatment after more than 20 years of recovery. The results of N : P in different tissues showed that FG, MG and UG vegetation restorations were N-limited. N and P homeostasis was present in trees, especially *Ulmus pumila*, while the degree of homeostasis was significantly impacted by afforestation species and plant tissues. The N:P results suggested that lower N deficiency stress may have been experienced by three experimental plants. We concluded that UG was better suited to the dry climate in Horqin Sandy Land.

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