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Encroaching Mongolian oak aggravates nitrogen limitation in southern Asian boreal forest

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Mitigation of temperate broadleaved trees into southern boreal forest has occurred in response to rapid climatic warming, consequently resulting in profound changes in species composition and ecosystem functions of southern boreal forest. However, the biogeochemical effect of migrating temperate trees on boreal forest trees remains poorly understood. Here we performed a 52-sites survey along the temperate-boreal forest ecotones in Northeastern China to uncover that the encroaching Mongolian oak, dominant trees in temperate forest, has affected N nutrition of Dahurian larch, the dominant trees of regional boreal forest. Specifically, we tested following hypotheses: (i) encroaching Mongolian oak affects N availability for Dahurian larch via modifying soil N availability; (ii) Mongolian oak directly affects N dynamic of Dahurian larch via competing for available N against Dahurian larch. Our results show that the foliar ^{15}N is significantly lower in Mongolian oak than in co-occurring Dahurian larch. Soil ^{15}N is negatively correlated with soil C:N ratio and stand slope but is not affected by the encroachment of Mongolian oak. Both foliar ^{15}N abundance and difference ($\delta^{15}\text{N}_{\text{foliage}} - \delta^{15}\text{N}_{\text{soil}}$) of Dahurian larch are significantly affected by the dominance of Mongolian oak, suggesting that encroaching Mongolian oak aggravates N limitation of boreal Dahurian larch. Our findings highlight an unexpected biogeochemical effect of migrating temperate trees on boreal forest.