

Publication

Whole-Tree Response of Non-Structural Carbohydrates, Carbon and Nitrogen Concentrations in Two Temperate Tree Species to 10-Year Nitrogen Fertilization

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This study aimed to investigate the effects of long-term nitrogen fertilization on non-structural carbohydrates (NSC) and nitrogen (N) status and their interaction in mature trees at the whole-tree scale. Ten g N m⁻² yr⁻¹ of ammonium nitrate fertilizer were applied to 26-year-old *Larix gmelinii* Rupr. (larch) and *Fraxinus mandschurica* Rupr. (ash) trees in Northeastern China from 2002 to 2012. NSC, total carbon (C) and total N concentrations in different compartments were examined. For both species, concentrations of NSC and their components (soluble sugars and starch) tended to increase in aboveground organs but decrease in fine roots following N fertilization, with significant ($p < 0.05$) changes only observed in ash stems and larch roots. N fertilization increased N concentrations and decreased the C:N ratio in all organs, especially in foliage and roots, while the effects of fertilization on total C concentrations varied with tree species and organs. Concentrations of NSC (mainly reflected in soluble sugar) were generally negatively correlated with N concentration in fine roots but positively related to N concentration in aboveground woody organs in both control and fertilized treatments. However, fertilization strengthened this correlation in fine roots and weakened this relationship in aboveground organs. This study provides a decade-long insight into the effect of currently increasing N deposition on tree growth and function.

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