Effects of $CaCl_2$ and $AlCl_3$ Additions on Sugar Maple Fine Roots and Exchangeable Ions in Rhizosphere and Bulk Soils of a Northern Hardwood Forest

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Poster Abstract

Increased mobilization of aluminum and accelerated leaching of calcium and magnesium from the rooting zone have been linked to strong acidic inputs to northern hardwood forests. Changes in soil chemistry have been hypothesized to adversely affect Ca and Mg uptake and stress tolerance of sugar maple (*Acer saccharum* Marsh.) on base-poor soils. From 1995 to 1997, three experimental treatments were applied to four replicate northern hardwood plots: $CaCl_2$ (10 g/m^2), $AlCl_3$ (4.5 g/m^2) and control (no chemical additions). We sampled bulk soil, rhizosphere soil and fine roots from four overstory sugar maples in each plot. The $AlCl_3$ treatment resulted in 68% lower (Ca+Mg)/Al molar ratios in bulk soils and 63% lower ratios in rhizosphere soils. Other differences in Al, Ca and Mg concentrations between treatments were too small to be significant. We found the rhizosphere to be depleted in exchangeable and organically-bound Al and enriched in Ca and Mg relative to bulk soil. Fine root concentrations of Al were significantly greater (64%) in $AlCl_3$ treated plots than controls. These results suggest increased mobilization of Al due to decreases in the (Ca+Mg)/Al molar ratios in bulk and rhizosphere soils may lead to preferential adsorption of Al on root exchange sites. Interference of Ca and Mg uptake may have long-term implications for sugar maple nutrition in base-poor soils.

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