Topographic influence on leaf nitrogen and phosphorus stoichiometry of Japanese cypress in a temerate forested watershed

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Plant stoichiometory has been potentially used to diagnose phosphorus (P) limitation caused by increased atmospheric nitrogen (N) deposition. However, spatial variability of N:P stoichiometry within an forested watershed has not been evaluated. This study conducted synoptic sampling of leaf in 27 plots within a temperate forested watershed on low P availability rock (serpentine bedrock) with a moderately high atmospheric N deposition (16 kg N ha^{-1} yr^{-1}) to assess the effects of spatial topographical variation on N:P stoichiometry. Leaf N and P concentrations and N:P ratio of Japanese cypress were assessed and their spatial variations were evaluated across a catchment. The results showed that average leaf P concentration was low (0.66 ±0.16 mg g^{-1}) across the sites, while leaf N concentration was high (13.0 ±1.5 mg g^{-1}), and subsequently N:P ratio was high (21 ±5). In addition, aboveground biomass increment of Japanese cypress was positively correlated to litter P, implying the P limitation of Japanese cypress at the study site. However, in 7 plots out of 27 N:P ratio was close to or below 16, the proposed indicator of P limitation. Leaf P concentrations responded to the index of convexity (IC) values more than N. Subsequently N:P ratio correlated with IC, suggesting N:P ratio are susceptive to topologic features. This could be partly caused by smaller spatial variability of N availability than P owing to increased atmospheric N deposition. This study concluded that topography should be taken into consideration when diagnosing P limitation caused by N deposition.

Keywords: P limitation, N saturation, Atmospheric deposition, Serpentine bedrock

