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An Invariant Allometric Scaling of Nitrogen and Phosphorus in Leaves, Stems and Fine roots Along an Altitudinal Gradient

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Plant nutrient allocation explicitly links the plant resource capture strategy to the material and energy cycles of ecosystems. The nitrogen (N) to phosphorus (P) relationship in plant organs is of particular interest, as N and P are the major limiting elements for plant growth. Here we analyze the relations of N and P in leaves, stems and fine roots of 269 species along an altitudinal transect on the northern slope of Changbai Mountain, China, to explore the partitioning of nutrients in major plant organs and its response to environmental gradient. We find that N, P contents as well as N: P ratio are significantly higher in leaves than in stems and fine roots. Nutrient contents of major plant organs show consistent response to the altitudinal gradient. N and P contents of leaves, stems and fine roots increased while N:P ratios decreased with elevation. Moreover, general allometric scaling relations of N and P is found in leaves, stems and fine roots with slopes of 0.78, 0.72 and 0.87, respectively, and differences exist among different plant growth forms. In general, the exponent values of the allometric scaling of N and P in leaves, stems and fine roots keep as an invariant constant along the altitudinal gradient, which implies the existence of conserved nutrient allocation strategies in plant.