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# The effect of species and environment on the associations between foliar and woody traits in tropical forests

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Tropical trees developed complex mechanisms of intrinsic nutrient cycling in order to cope with low nutrient supply from the soils, that are usually nutrient depleted due to their highly weathered nature. The way this internal nutrient cycling works is mainly mediated by the species idiosyncrasies and by environmental factors that work on multi-levels, from a local to a regional scale. The woody tissues of plants reflect life-history strategies of species and play fundamental roles in plant physiology and ecology. The woody tissues present lower nutrient concentration than foliar tissues. Nevertheless, wood is the most important nutrient storage in these tropical ecosystems because in relative terms woody biomass is the highest in these tropical forests. Hence, taking into consideration the aforementioned ecologic role of wood, foliar and woody tissues might be functionally associated in order to cycle nutrients within the trees. In the present study, we analysed element concentration in branches and leaves of tropical trees in six plots in a paired design of low and high soil fertility distributed Bolivia, Peru, and Ecuador. We assessed the chemical inter-organ relation between traits in both organs by using mixed models in order to disentangle the species effect from the environmental effect on the mean trait variation. Some traits were significantly associated with the two organs and these scaling relations were controlled only by the species identity (i.e. species effect), whilst other traits such as [Ca] scaled significantly among organs and this relation was controlled by local environmental factors (e.g. soil fertility). Some nutrient concentrations in wood presented significant positive relations plant hydraulic traits (Water holding capacity) whereas other nutrients were only negatively associated with wood density (WD). By using the effect of species to evaluate the inter-organ chemical scaling relationships we infer how tropical species developed coupled responses between wood and leaf in order to manage essential nutrients within their structures. We also discuss how cations locked up in the woody tissues of these trees feature an osmotic role by contributing to the hydraulic relations of those trees.