Ontogeny, light and topography shape leaf functional trait values of individuals in Neotropical tree species complexes

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Theories on the maintenance of biodiversity have mainly considered questions pertaining to the species coexistence level. This approach, however, has some limitations as there is no unanimity about how to define a species, and individuals within species present variation in performance, phenotypes, and genes. A growing body of research has suggested that intraspecific trait variability is likely to shape community assembly. To gain insights into the structure of intraspecific trait variation in tropical tree species complexes, we examined leaf functional trait variation along ontogeny and across the environment in a highly diverse tropical forest of the Guiana Shield. We collected leaf functional traits from 766 adult trees belonging to five species and two genera in permanent plots encompassing a diversity of micro-habitats, i.e. topographical levels. We tested the role of ontogeny and abiotic environment on leaf functional trait variation with a hierarchical Bayesian model. Diameter at breast height, representing indissociable effects of ontogeny and access to light, was positively correlated with leaf thickness and leaf mass per area and negatively with leaf area. The changes towards more conservative trait values for bigger trees in more luminous environment, previously observed between seedling/sapling and adults, persist in later life changes. Moreover, higher topographic position resulted in a shift from acquisitive to conservative strategies, both across and within species. Our results suggest that intraspecific trait variability could increase species tolerance to environmental filtering and contribute to species coexistence. This highlights the interest of a structured and thoughtful sampling effort within species and individuals for trait-based studies of community assemblage.