

Functional Diversity of Understory Shrubs along an Elevation Gradient in the Atlantic Forest of Brazil

Along altitudinal gradients, factors such as less partial atmospheric CO₂ pressure, and higher solar radiation promote water loss from plants. This tradeoff necessitates that plants possess morphological traits that promote photosynthesis while minimizing water loss. We evaluated patterns of functional convergence and divergence in understory shrub communities in response to the altitudinal variation in the Brazilian Atlantic Forest. By measuring attributes of plant leaf morphology and related traits we investigated what functional characteristics were relevant for structuring understory shrub communities. A series of functional traits descriptors of plant fitness were measure, including: leaf water content (LWC), leaf mass per area (LMA), leaf thickness (TH), leaf density (DEN), leaf area (LA) and leaf area ratio (LAR). Samples (n=449) were collected along seven sites ranging from 164-692.00 m of altitude. Linear regression was used to determine relationships between traits and to evaluate the response of traits to the altitudinal gradient. We expected shrubs with a more conservative use of resources at higher elevations, i.e. smaller leaves with higher LMA, reflected by thicker foliage as well as greater LWC. The only traits that responded alone to altitudinal gradient were LAR and LMA. These traits correspond to syndromes associated with resource conservation, where higher LMA and lower LAR indicate greater resource storage in relation to growth rates. In the first four lowest elevation sites, DEN explained LMA better than TH. However, at the three highest elevation sites TH became more important. This trend is indicative of a strategy that enhances photosynthesis per leaf area where more cellular layers and less investment in leaf area creates a positive trade-off between water transport and gas exchange. Our results indicate that variations in plant morphology indicate a functional convergence along the resource gradient characteristic of increasing elevations of Brazilian Atlantic Forest understory communities.

Key Words: Altitudinal gradient, Atlantic forest, functional traits, plant morphology.