A trait-based plant economic framework can help increase the value of reforestation for conservation

ABSTRACT

While reforestation is gaining momentum to moderate climate change via carbon sequestration, there is also an opportunity to use tree planting to confront declining global biodiversity. Where tree species vary in support of diversity, selecting appropriate species for planting could increase conservation effectiveness. We used a common garden experiment in Borneo using 24 native tree species to examine how variation among tree species in their support of beetle diversity is predicted by plant traits associated with "acquisitive" and "conservative" resource acquisition strategies. We evaluate three hypotheses: (1) beetle communities show fidelity to host identity as indicated by variation in abundance and diversity among tree species, (2) the leaf economic spectrum partially explains this variation as shown by beetle preferences for plant species that are predicted by plant traits, and (3) a small number of selected tree species can capture higher beetle species richness than a random tree species community. We found high variation among tree species in supporting three highly intercorrelated metrics of beetle communities: abundance, richness, and Shannon diversity. Variation in support of beetle communities was predicted by plant traits and varied by plant functional groups; within the dipterocarp family, high beetle diversity was predicted by conservative traits such as high wood density and slow growth, and in non-dipterocarps by the acquisitive traits of high foliar K and rapid growth. Using species accumulation curves and extrapolation to twice the original sample size, we show that 48 tree species were not enough to reach asymptote levels of beetle richness. Nevertheless, species accumulation curves of the six tree species with the highest richness had steeper slopes and supported 33% higher richness than a random community of tree species. Reforestation projects concerned about conservation can benefit by identifying tree species with a disproportional capacity to support biodiversity based on plant traits.