

Differing Life History Characteristics Support Coexistence of Tree Soil Generalist and Specialist Species in Tropical Rainforests

ABSTRACT

Niche differentiation is a prominent mechanism for explaining tree species coexistence in tropical rain forests. Theory predicts that species that are specialized on a set of environmental conditions should competitively exclude generalists in those conditions, and that environmental heterogeneity allows the coexistence of many different species based on niche specialization. Yet, many tropical tree species of the family Dipterocarpaceae have broadly similar habitat preferences, with some occurring widely across several soil types. These soil generalists clearly persist despite the presence of other dipterocarp species that show clear soil specialization. We evaluate comparative seedling performance (growth and survival) of six *Shorea* species (Dipterocarpaceae) which differ in their adult tree habitat associations within the Sepilok Forest Reserve (Borneo, Malaysia). We tested the hypothesis that seedlings of species associated with a particular soil type perform better on that soil type than seedlings of soil generalist species, with generalists in turn performing better than specialists on a different soil type. We conducted a reciprocal transplant experiment including two soil types (alluvial and mudstone) and two light treatments (gap and understory). The soils differed in soil acidity, Al and P concentration. Observed species-specific differences in seedling responses to soil, light, and occasional flooding events could partially explain observed adult distribution, although not all species could be fully differentiated along these axes. Other trade-offs, such as investment in defense against herbivores and tolerance to soil waterlogging, may play additional roles in explaining coexistence of these species.