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Species Composition and Diversity in two Selected Lowland Tropical Rainforests in Sri Lanka and their Relationships to Temperature and Precipitation

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Abstract

Tropical rainforests are characterised by high species diversity, which may be due to a range of factors such as climate, topography, soil properties and the level of disturbance, both natural and anthropogenic. This study focused on investigating the species composition, richness, diversity and their conservation status in lowland tropical rainforests at two selected locations in Sri Lanka and determining their relationships to temperature and precipitation. Two permanent one-hectare sampling plots each were established at the Kanneliya (KDN1 and KDN2) and Pitadeniya-Sinharaja (PTD1 and PTD2) Forest Reserves. All trees with dbh≥10 cm were enumerated. A total of 3,303 trees were recorded, representing 158 species from 91 genera and 53 families, with a total basal area of 196.26 m^2. Most abundant plant species were *Alstonia macrophylla* in KDN1 (11.7% of trees with dbh≥10 cm), *Syzygium grande* in KDN2 (9.8%), *Shorea affinis* in PTD1 (15.8%) *Mesua thwaitesii* in PTD2 (17.5%). *Cullenia rosayroana* (7.2%) is the most abundant species within the whole study area. While 25 species were recorded in all four plots, 70 species were found in only one location. Genus S*horea* (18.6%) is the most common including 12 different species and Dipterocarpaceae (21.9%) is the most common family including 19 species. KDN1 recorded 1,011 plants from 108 species, with 74.3% endemic, 12.8% native and 11.9% exotic species. Other study sites recorded only endemic (88% at KDN2, 83.7% at PTD1 and 82.3% at PTD2) and native species. In comparison to PTD, KDN recorded higher numbers of trees with dbh≥10 cm (Chi-square $p<0.0001$), species ($p<0.0001$) and genera ($p=0.0091$). KDN also recorded a higher number of families but the difference was not significant ($p=0.358$). All indices of species diversity (Shannon index, H and Simpson index, D), evenness (J) and richness (R) are higher at KDN. However, only the difference in D was statistically-significant at $p=0.05$. Multiple regression analysis using the stepwise procedure showed that the number of trees with dbh≥10 cm and the species number increased with increasing average annual air temperature (T) but decreased with annual total precipitation (P). On the other hand, the numbers of genera and families increased with decreasing P with T not having a significant influence. The two diversity indices, H and D, increased with decreasing P and increasing T. In contrast, increasing P decreased J and R whereas variation in T did not have a significant influence. These findings provide important insights in to dynamics plant diversity in response to environmental changes.

Keywords: Species composition, Species diversity, Tropical rainforests