

Variation of Geochemical Properties of Soils in Tropical Lowland Rainforests in Sri Lanka

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Abstract

Tropical lowland rainforests (TLRFs) of Sri Lanka are considered as diverse ecosystems which play a vital role in climate change mitigation. In recent years, increasing deforestation leads to diminishing their potential ecosystem roles. For efficient forest conservation, knowledge of both above- and below-ground characteristics of TLRFs is required. Currently, above-ground information on TLRFs is sufficiently available but the details on the below-ground characteristics are limited. Therefore, this study was carried out to investigate pedo-geochemical properties of lowland rain forests of Kanneliya (KDN) and Pitadeniya, (PTD) in Sri Lanka. Four sampling plots with 1 ha in size (KDN1, KDN2, PTD1 and PTD2) were established, selecting altitudes of 117, 174, 509, and 618 m asl, respectively. Five representative near-surface (up to 25 cm) samples were collected from each plot for the investigation. Soil pH, electrical conductivity (EC), and cation exchange capacity (CEC) were measured while soil organic matter (SOM) content was determined by (i) Walkley-Black (WB) and (ii) Loss on ignition (LI) methods. Data were analysed by ANOVA and means were compared using Duncan's test. All measured parameters were significantly different ($P < 0.05$) among the sampling plots. Soil pH and EC values were ranged between 3.43–3.78 and 0.28–0.44 dS m⁻¹, respectively. The highest CEC was recorded in PTD2 (11.09±3.44 cmol(+)/kg) whereas the lowest was in PTD1 (5.31±1.26 cmol(+)/kg). The highest SOM was recorded in PTD1 (17.71±4.42% in WB, 18.04±3.98% in LI) whereas the lowest was noted in PTD2 (5.81±3.07% in WB, 8.21±2.13% in LI). According to the comparison made between WB and LI methods, LI method recorded higher SOM content. The actual SOM and volatilizable water in hygroscopic mineral fractions might be the reason for the higher values in LI method. All acquired data were compared with standard interpretation data and accordingly, soils of the measured TLRFs are acidic, non-saline and non-reduced with sufficient soil aeration. Even though, TLRF vegetation produce high amount of biomass, soil CEC and SOM contents are low in the study area due to rapid microbial decomposition and absorption of dense vegetation. There was no linear relationship between measured parameters and altitude. Overall, measured soil chemical properties can be considered as ideal indicators of TLRFs conservation and therefore, it needs to be correlated with above-ground properties for understanding the behaviour of TLRFs responding to conservation strategies.

Keywords: Forest conservation, Soil chemical properties, Soil organic matter content, Tropical lowland rainforest