

Soil nutrient availability in different vegetation types of Knuckles conservation forest in Sri Lanka

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Estimates of soil nutrient availability in tropical land use types are critically important to understand the function of soil in the global nutrient cycles and the sustainable management of tropical ecosystems. The aim of this study was to quantify and compare the macro and micro nutrient availability in soils in different vegetation types in the Knuckles Conservation Forest (KCF) of Sri Lanka. Soil samples were collected within two depth layers (0-15 and 15-30 cm) considering the proportion and the accessibility to each vegetation type. The selected vegetation types were montane forest (MF), sub-montane forest (SMF), moist monsoon forest (MMF), open and sparse forest (OSF), grassland (GL) and forest plantation (FP). The macro nutrient (N, P, K, Ca and Mg) and micro nutrient (Fe, Mn, Cu and Zn) availabilities were analyzed for two soil depth layers (0-15 and 15-30 cm). A total of 1224 samples were collected from two depths and pooled to form 408 composite samples. General Linear Model in Analysis of Variance was performed using Minitab 16 to analyze the data. Availability of N and P in KCF soils ranged between 8.18 - 19.76 mg/kg and 0.21 - 0.45 mg/kg, respectively among the vegetation types in the 0-15 cm layer. N and P availability was significantly higher in SMF (21.23 and 0.49 mg/kg respectively) and OSF (22.08 and 0.47 mg/kg) soils compared to other vegetation types. Significantly low N availability was observed in both GL (5.07 mg/kg) and MF (7.32 mg/kg) soils. It was also found that P was significantly deficient in MF soils compared to other vegetation types in KCF. Vegetation types in KCF showed significant differences in the availability of K, Ca, Mg, Fe, Mn, Cu and Zn in soils. Fe availability in soils varied between 187.4 - 682.3 mg/kg while Mn varied from 28.52 - 85.26 mg/kg. Results concluded that spatial availability of nutrients such as N and P in mineral soil may be decreased in MF comparing to the other vegetation types due to the environmental conditions such as acidic soil pH, low temperature and microbial growth existing at high altitudes of KCF. This suggests limitation of plant growth in MF by deficiency of one or several nutrients at higher altitudes. Availability of K and Ca in KCF may be affected by parent material exposed on to the soil surface. This baseline information will address the dearth of data on soil nutrient availability of different ecosystems in the tropics, hence useful in future conservation purposes of the tropical forest ecosystems.

Keywords: Available nutrients, Knuckles forest, Tropical ecosystems