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SOIL NUTRIENT DYNAMICS IN THE KADOLKELE MANGROVE RESERVE, NEGOMBO, SRI LANKA

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Abstract

Mangroves are vital ecosystems that provide essential services such as shoreline stabilization, carbon sequestration, and nutrient cycling. Though numerous studies have been conducted on mangrove vegetation, their soil nutrient dynamics remain poorly understood. This research focuses on the relationship between tidal inundation and soil nutrient dynamics in the Kadolkele Mangrove Reserve, Negombo, Sri Lanka. Soil samples were collected along three (03) 100 m transects at 20 m intervals from seaward to landward zones during the early southwestern monsoon season (May–July 2025). Surface soil (2–10 cm depth) was collected and soil pH, electrical conductivity (EC), organic matter (OM), available nitrogen (N), available phosphorus (P), and exchangeable potassium (K) were measured using standard analytical procedures. A data matrix comprising soil nutrient data from plots established along the transects was analyzed using multivariate statistical methods to identify trends and relationships. Results showed substantial spatial variability in soil properties: pH ranged from 4.63 to 6.10, EC from 0.01 to 17.21 dS/m, P from 5.85 to 30.50 mg/kg, K from 85.27 to 1047.67 mg/kg, and OM up to 13%. Principal Component Analysis (PCA) indicated clustering of samples from frequently inundated seaward plots, reflecting homogenization by tidal mixing, whereas landward plots exhibited greater heterogeneity under reduced tidal influence. In conclusion, these findings highlight the complex interaction of hydrology, salinity, and tidal factors in regulating nutrient availability, which is important for the health and stability of mangrove ecosystems.

Keywords*: Soil Nutrient Dynamics, Spatial Variations, Physiochemical Parameters, Tidal Mixing, Complex Interactions*