YSCMR 2021

Proceedings of the Young Scientists' Conference on Multidisciplinary Research - 2021

Virtual International Conference

21st October 2021

"Multidisciplinary Research for Tomorrow's Challenges"







Spatial variation of soil available nitrogen and phosphorus concentrations in tropical Mangrove ecosystem at Erukulampiddy of Mannar region, Sri Lanka

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Background: Erukulampiddy consists of mangroves (*Avicenia marina, Rhizophora mucronata* and *Soneratia alba*) with intermittently spread saltmarsh species. The tidal creek and the mudflats of Erululampiddy tend to accumulate more sediments due to its location in the Palk bay and the specific shape, compared to the adjacent mangroves in the coastal fringe. However, the available nitrogen (N) and phosphorous (P) concentrations in mangrove soils of many tropical and subtropical mangrove ecosystems are reported as low and limited for the growth of mangrove plants.

Objectives: Spatial heterogeneity of soil N and P concentrations in Erukulampiddy was intended to be studied while correlating to other soil parameters (pH, electrical conductivity (EC) soil moisture content (SMC) and microbial biomass carbon (MBC)).

Methods: Adhered to grid method, thirty-five soil samples were collected from the surface depth (0-15 cm) at randomly chosen 10m×10m plots during the dry span of the site, and subsequently analysed for nitrate, phosphate, ammonium and for above parameters. Principal component (PC) analysis and agglomerative hierarchical clustering were performed using Minitab 17.

Results: The PCs made significance (accounting 62% of data variability) for the variables; PC1: EC (+) and phosphate (+), PC2: nitrate (-) and pH (+) and PC3: ammonium (+) and MBC (-). Both score plots based on PCs and the dendogram indicated that plant communities occur in a wide but overlapping range of ammonium and P availability. The concentrations of soil N (N-NO₃⁻= 1.6- 9.9 mg kg⁻¹ and N-NH₄⁺= 5.6- 66.5 mg kg⁻¹) and P (42.1- 92.1 mg kg⁻¹) varied over space irrespective of the type of plant community, except at the woodland plant community where it revealed high nitrate (4.1- 9.9 mg kg⁻¹) and low ammonium (5.6- 9.8 mg kg⁻¹) and P (42.6- 62.2 mg kg⁻¹) concentrations.

Conclusion: High spatial heterogeneity of available N and P was revealed in the studied mangrove ecosystem, and soil EC and pH affect the formation of gradients in available P and N concentrations.

Keywords: *Electrical conductivity and soil pH, Nutrient availability, Spatial heterogeneity, Soil conservation and management*

Acknowledgement: Department of Wildlife Conservation and the Forest Department of Sri Lanka