

Assessment of the Heavy Metal Concentrations in Mangrove Leaves of Negombo Lagoon

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Mangrove ecosystems play an important role in the biogeochemistry of heavy metal contamination in tropical coastal areas. During the last decades, heavy metals are one of the most serious contaminants in those environments due to its toxicity, durability and bioaccumulation problems with the long residence time within the food chain. Mangrove leaves are the primary producer of the food chains or food webs in mangrove ecosystems where there is a direct effect on the human health. The bioaccumulation levels of heavy metals in mangroves can be estimated by assessing such levels in leaves, sediments and water in the study area. This study was a part of a M.Phil. research and the main objective of this study was to assess the concentrations of selected heavy metals to understand the levels of contamination in the mangrove leaves in a selected lagoon system. The 27 locations of Negombo lagoon which is situated in urbanized area in Gampaha District of Sri Lanka was selected for the study. Four mangrove species of *Rhizophora mucronata*, *Rhizophora apiculata*, *Avicennia marina* and *Lumnitzera racemosa* were chosen since these are the most common species in the lagoon. Mangrove leaf samples categorized as young, matured and old and were collected in the wet and dry seasons of 2015 and 2016. Leaf samples were cleaned and oven dried prior to grinding for fine powder. The elemental concentrations of heavy metals, Mn, Fe, Cr, Co, Ni, Cu, Zn, As, Hg and Pb were analyzed in the dried powder of mangrove leaves (297 samples) using Particle-induced X-ray emission (PIXE) technique established in Medical University, Iwate, Japan. The results were evaluated to study the spatial and temporal variations of heavy metal concentrations in mangrove leaves of the Negombo lagoon. The distribution of metals in mangrove leaves were departed and depended on the mangrove species as well as climatic seasons in study period. The most prominent species of *R. mucronata*, *R. apiculata* were represented by 262 samples and both species were having same concentration levels except Mn and Zn, which act as essential plant nutrients, were greater in *R. apiculata* than the other species. The ranges of metal concentrations (in ppm) of *R. apiculata* leaves in the studied area were observed in the order: Mn (15.2-453.0) > Zn (5.4-276.4) > Fe (28.6-224.9) > Cu (0.1-9.3) > Cr (0.2-7.3) > Hg (ND-5.9) > Pb (ND-4.0) > Ni (ND-2.3) > Co (ND-1.7) > As (ND-1.0). The heavy metal uptake by young, matured and old leaves were showed significant deviations for most of the studied metals. Cr content in all leaves was same and some metals (ie. Fe) were higher in old leaves and some metals (ie. Zn) were higher in young leaves. A comparative evaluation of studied metals was carried out with the similar studies conducted in the world. In general, heavy metal concentrations in mangrove leaves of Negombo lagoon were lower than the permissible limits as recommended by WHO (1996), except Cr, Zn and Pb.

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