Trace Element Phytoremediation Potential of Mangrove Plants in Indian Sundarban

Authors : Ranju Chowdhury, Santosh K. Sarkar

Abstract : Trace element accumulation potential of ten mangrove species in individual plant tissues (leaves, bark and root/pneumatophore) along with host sediments was carried out at 2 study sites of diverse environmental stresses of Indian Sundarban Wetland, a UNESCO world heritage site. The study was undertaken with the following objectives: (i) to investigate the extent of accumulation and the distribution of trace metals in plant tissues (ii) to determine whether sediment trace metal levels are correlated with trace metal levels in tissues and (iii) to find out the suitable candidate for phytoremediation species. Mangrove sediments showed unique potential in many- fold increase for most trace metals than plant tissues due to their inherent physicochemical properties. The concentrations of studied 11 trace elements (expressed in µg g -1) showed wide range of variations in host sediment with the following descending order: Fe (2865.31-3019.62) > Mn (646.04- 648.47 > Cu (35.03- 41.55) > Zn (32.51- 36.33) > Ni (34.4- 36.60) > Cr (27.5- 29.54) > Pb (11.6- 20.34) > Co (6.79- 8.55) > As (3.22- 4.41) > Cd (0.19- 0.22) > Hg (0.06- 0.07). The ranges of concentration of trace metals (expressed in µg g -1) for As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb and Zn in plant tissues were 0.006- 0.31, 0.02- 2.97, 0.10- 4.80, 0.13- 6.49, 4.46- 48.30, 9.20- 938.13, 0.02- 0.13, 9.8- 1726.24, 5.41- 11.34, 0.04 - 7.64, 3.81- 52.20 respectively. Among all trace elements, Cd and Zn were highly bioaccumulated in Excoecaria agallocha (2.97 and 52.20 µg g -1 respectively). The bio- concentration factor (BCF) showed its maximum value (15.5) in E. agallocha for Cd, suggesting that it can be considered as a high-efficient plant for trace metal bioaccumulation. Therefore, phytoremediation could be extensively used for the removal of the toxic contaminants for sustainable management of Sundarban coastal regions.

Keywords : Indian Sundarban, mangroves, phytoremediation, trace elements
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