DETERMINATION OF POTENTIAL USE OF CHITOSAN FOR THE REMOVAL OF Pb, Fe AND Mn IN THE DRINKING WATER SAMPLES COLLECTED FROM DIFFERENT AREAS OF SRI LANKA

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Abstract

Water quality is an important parameter which affects the human health significantly. Over the last couple of decades, the drinking water sources in Sri lanka have been polluted from heavy metals in considerable amounts. As a developing country, Sri Lanka has a big needy of a low cost natural biosorbent which can be a good solution to purify heavy metal polluted drinking water especially in the North Central Province (NCP). This would be a very important factor as Chronic Kidney Disease (CKD) and other reported kidney diseases from NCP may associate with the toxicity of one or more heavy metals. Chitosan; deacetylated product of chitin has been used as a chelating agent for the removal of toxic/heavy metals mainly from industrial wastewater and as a non-toxic flocculent in the treatment of organic polluted wastewater; but little attempt has been made to understand the ability of chitosan to uptake heavy metals in ppb levels. The current study focuses on potential of using commercially available chitosan as a low cost, environmentally friendly biosorbent for purification of drinking water that have heavy metal pollutants in low levels. In the current study, drinking water samples were collected from different areas of the country including Anuradhapura, Nikkawewa, Vavuniya, Trincomalee, Badulla and Kantale. First the basic parameters such as colour, pH, total hardness and initial metal ion concentration of lead, manganese, zinc, iron and copper were measured and recorded. The pH values of the collected water samples range from 6.53 – 7.31 which were in the range of accepted pH value range (6.5 – 8.5) for drinking water defined by World Health Organization (WHO). But hardness in some of the collected water samples had exceeded 250 ppm, the maximum permissible level defined by the Board of Investments of Sri Lanka (BOI) for the drinking water. According to the WHO standards, the zinc and copper ion concentrations of all the collected water samples were in the permissible range, but in some of the water samples lead, iron and manganese concentrations were higher than the maximum permissible levels. Interestingly, all the water samples with initial metal ion concentrations above the permissible limits were successfully reduced into the permissible range defined by WHO by treating with chitosan indicating that, chitosan might be a good candidate which can be used to remove heavy metals from polluted drinking water. The average percentage removal of lead, iron and manganese by chitosan is 55.77%, 69.65% .and 69.60% respectively.