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Evaluation of the Quality of the Groundwater used for Domestic Purposes in the Anuradhapura District of the Dry Zone and the Efficacy of Laterite Soil-based Household Water Filters as Adsorbents

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Abstract

High concentrations of hardness, Ca, Mg, NO_3^-, PO_4^{3-}, F^- and, heavy metals in the groundwater being consumed in Sri Lanka's North Central province are becoming a serious health concern. The current study examined the groundwater quality in the Anuradhapura district as well as the effectiveness of groundwater purification by a laterite soil-based water purification device for Domestic Purposes. Chemical parameters (hardness, Ca, Mg, NO_3^-, PO_4^{3-}, F^-, Cr, Cd and Pb) were analyzed in randomly collected 35 number of well water samples during the dry season to assess the quality. The range of hardness was (21-1730) mg/l, with an average hardness of 471 mg/l. Anuradhapura had high levels of Ca and Mg, with average concentrations of 122 mg/l, ranges of (5-429 mg/l) and 40 mg/L (2-160 mg/l), respectively. Phosphate levels ranged from (0.02-0.83 mg/l), with an average of 0.08 mg/l. Whereas nitrate concentrations ranged from (0.05-6.5) mg/l with an average of 0.59 mg/l and, fluoride levels ranged from (1.8-4.0 mg/l), with 2.3 mg/l being the average. Heavy metal concentrations that were below the WHO and Sri Lankan Standard limits had no discernible effect. The laterite soil-based water purification cylinder removed the hardness, Ca, Mg, NO_3^-, PO_4^{3-} and, F^- by adsorption. It was removed the hardness at an average rate of 89.7%, Ca at 89.32%, Mg at 86.87%, P at 100%, NO_3^- at 92.6% and F^- at 81.6%. The outcomes showed that, well water in Anuradhapura region needs to be treated beforehand so it can be consumed. The laterite soil-based water filter performed well in terms of removing high hardness, Ca, Mg, P, NO_3^-, and F^-.

Keywords: Groundwater quality, Laterite, Adsorption, Removal efficiency