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Removal of Manganese from Groundwater Using a Biological Arsenic Removal Ceramic Filter

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Abstract

In this paper, manganese (Mn) removal efficiency from groundwater was assessed using a simple and low-cost household-based biological arsenic (As) removal filter (ARF). The ARF was constructed using a ceramic filter (made of clay soil and rice bran), an iron netting box, and iron bacterial sludge liquor in a clay pot. Fourteen ARFs were installed in three villages in Khulna (southwestern region of Bangladesh), and Mn removal performances were monitored over the course of 31 days. Groundwater samples from 14 tube wells were analyzed for their major physicochemical quality. The mean concentration of Mn in the water samples was 0.36 mg L^{-1}, which is 3.6 times higher than the Bangladesh standard limit of 0.1 mg L^{-1}. Principal component analysis (PCA) of groundwater quality showed that the contamination of Mn in groundwater was more likely due to the dissolution and weathering process of the MnO(OH) minerals. The ARFs produced less than 0.1 mg L^{-1} of effluent Mn from an average tubewell water concentration of 0.36 mg L^{-1}. The Eh-pH values observed in all filters indicated that Mn is primarily oxidized by *Leptothrix* group of iron bacteria and removed through filtration. With respect to long-term performance, the filter was very