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Groundwater Contamination in Jaffna Red Beds: Mainly Focused on Nitrate and Trace Elements

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Abstract

The Jaffna peninsula is dependent on groundwater for all its water requirements and predominantly for agricultural activities. Studies on effect of fertilisation and groundwater pollution in such an area are of prime importance. Especially, nitrate rich drinking water is potentially harmful to human health, particularly to infants. It is recommended that pregnant women and lactating mothers should limit nitrate consumption. According to the Jaffna hospital sources, people living in red bed area mostly affected by water bone diseases. Therefore, this study mainly focused on behaviours of nitrate and associated trace elements (Li, Cs, Cu, Sr, Zn, Mn, Fe, K, Mg and Na) in the wells around the red bed in order to investigate source and mobility.

Physical parameters of water also can be determined the quality of water. The pH was analysed by using pH meter. The results were along the study area in WHO and SLS limit. Electric Conductivity is considered as an important water quality parameter in assessing drinking and surface water. According to the SLS Standards, most of the sources had it above the permissible level. The source for the Salinity may be sea water intrusion in this agricultural land area. Therefore, the water not suitable for the drinking purpose.

Seventy randomly collected groundwater samples were analysed using atomic absorption spectrometer (AAS, Varian 240). Results indicated that most of the wells were highly contaminated with nitrate in red bed area than in the other regions. It was noted that, over dosage of fertiliser and agrochemicals cause for higher nitrate contamination. It is further observed that the red bed in the area is unconsolidated and mainly formed by iron courted sands with lower level of organic matter. This further concluded that nature of the red bed provides favourable conditions for leaching nitrate to groundwater rather than retaining in the soil. The trace elements such as K, Mg, Ca, Na, Sr, Li and Cu exceeded the permissible level for drinking water for all the wells. This may be due to sea water mixing with groundwater through the groundwater flow or by wind spray. Especially, element Ca and Sr may have accumulated by weathering of shell fragments in the calcareous deposits in the area. Conversely element Cu may have leached from agrochemicals. However, Zn, Fe, and Ba were in lower concentrations. In general, there were significant correlations between the elements which clearly concluded that the sources for the contaminations are diverse and anthropogenic.

Keywords: Fertilisation, Nitrate, Red bed, Groundwater