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A Study of Water Quality in Groundwater and Surface Ponds in Jaffna District

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Abstract

Jaffna district located north part of Sri Lanka comprising 7 islands and lies beneath by Miocene limestone aquifer where groundwater found within the karst holes created in the aquifer. Over one thousand ponds are playing a major role in aquifer refilling along the Jaffna district. Seawater barrier between the Navatkuli and Thondamanaru assists to hold rainwater in the lagoon and control seawater intrusion. The population of the Jaffna Peninsula depend on their drinking water requirement from dug wells and tube wells where agriculture purposes most of the farmers are using the ponds and agro-wells. Land use practices of the Jaffna is influenced the groundwater quality. The study ares covers whole Jaffna penesula and three island namely Punguduthеevu, Nagadeepa and Karainagar (929 km^2). The area represent 68% of agriculture lands, 19% urban lands and 13% other land use. Thus, in the present study 41 groundwater and 9 surface water samples were collected to represent the agricultural and urban areas of the Jaffna district. Water temperatures, Dissolved Oxygen (DO), pH, and Electric Conductivity (EC) were measured at the site itself using standard meters. $N\text{-}NO_3^-$, $N\text{-}NO_2^-$, $N\text{-}NH_3$, Total Phosphate (TP), Chemical Oxygen Demand (COD), Total Hardness (TH) and fluoride were measured using the standard methods. Total Coliform (TC) and Faecal Coliform (FC) count were obtained from membrane filtration methods. Water temperature, EC and DO in groundwater ranged from 27.5 to 31.8^o C, 482 to 15750 µS/cm and 2.0 to 15.9 mg/L respectively and ponds water were ranged 28.9 to 32.9^o C, 381 to 2227 µS/cm and 0.6 to 17.6 mg/L. Concentration range of $N\text{-}NO_3^-$, $N\text{-}NO_2^-$, $N\text{-}NH_3$, TP, fluoride, TH and COD in groundwater were <0.1 to 42.1 mg/L, <0.1 to 40.6 µg/L, 1.1 to 10.0 µg/L, 46.2 to 209.8 µg/L, <0.02 to 0.60 mg/L, 80 to 584 mg/L and 1.3 to 311.1 mg/L respectively and these parameters in ponds water ranged from 0.6 to 3.5 mg/L, 1.1 to 2.3 µg/L, <0.1 to 2.5 µg/L, 70.4 to 338.8 µg/L, <0.02 to 0.90 mg/L, 40 to 340 mg/L and 1.3 to 194.6 mg/L. Out of 41 groundwater sources tested, 90% exceed EC, 14% $N\text{-}NO_3^-$ and 34% exceeded TH where 86% and 28% ponds exceeded the EC and TH given by the SLSI drinking water standards. All most all ground and surface water samples were contaminated with TC where 94% of the samples were contaminated with FC. Thus, the over role assessment of water quality in Jaffna district showed that water sources are not good in healthy condition for drinking and much more attention should give to provide safe drinking water.

Keywords: Jaffna, Water quality, Microbial contamination