

HYDROCHEMICAL CHARACTERISATION AND WATER QUALITY ASSESSMENT OF THE COASTAL SPRINGS OF SOUTHERN KERALA, INDIA

D. Padmalal¹, K. Maya¹, K. Narendra Babu², R.S. Baiju¹ and B. Baburaj¹

¹Centre for Earth Science Studies, Thiruvananthapuram, Kerala, India.

²Former Head, Chemical Sciences Division, Centre for Earth Science Studies.

Abstract

This paper deals with the hydrochemical characterisation, drinking water quality and the factors responsible for water quality changes in the coastal springs of Varkala and the surrounding areas of southern Kerala. The springs emerge from the contact between sandstone and underlying carbonaceous claystone of the Warkalli Formation of Mio-Pliocene age exposed on the uplifted block south of the Achankovil Shear Zone. The springs are perennial with a cumulative water discharge of 539.90 million litres per year (mlpy). Except low pH (4.26–5.6), all the other chemical parameters of the spring water satisfy WHO and BIS drinking water standards. Among the nutrients, the Dissolved Inorganic Nitrogen (DIN) is markedly higher than Dissolved Organic Nitrogen (DON) and exhibits higher concentration in monsoon season (av. 2003 μgL^{-1}) than non-monsoon (av. 1213 μgL^{-1}) season. The observed increase in dissolved nitrogen in monsoon season is attributed to fertilizer intensive agricultural practices in the recharge areas of the springs over the years. The Dissolved Inorganic Phosphorus (DIP) and Dissolved Organic Phosphorus (DOP) vary from 29 μgL^{-1} to 81 μgL^{-1} and 11 μgL^{-1} to 43 μgL^{-1} , respectively. Na is the major cation in the spring waters while chloride dominates in the anionic group. The other cations are of the order $\text{Ca} > \text{Mg} > \text{K}$ and anions are the order $\text{HCO}_3 > \text{SO}_4$. An overall evaluation of the spring waters using standard models reveals that precipitation and weathering of minerals in the aquifer are the major causative factors responsible for the water quality changes of the Varkala springs. Microbiological analysis shows that the spring waters of the area are infected by bacteria. Disinfection and pH corrections are suggested prior to its potable use.

Keywords: Hydrogeochemical characterisation, Varkala, Coastal springs, Warkalli formation, Nitrogen, Phosphorus.