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Studies on the Physico-Chemical Parameters, Nutrients and Heavy Metal Concentrations of Five Bore Wells Water of Coimbatore City, Tamilnadu , India

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Abstract: ***The assessment of water quality from Bore well for drinking and domestic purposes was carried out from Coimbatore city, Tamilnadu. The bore well water quality was assessed by examining various nutrients and heavy metals. Bore well water samples were collected from five villages (Vadugapalayam, Pothiyampalaym, Ponnandampalayam, Sellapampalayam And Kaniyur) from Coimbatore city during June-November 2015. Physico-chemical parameters like air temperature, water temperature, pH, EC, total alkalinity, total hardness, Ca & Mg hardness. Nutrients and heavy metals like sodium, potassium, nitrate, phosphate, sulphate, fluoride, zinc, manganese, copper, iron, and chloride have been analyzed. The results were compared with WHO, BIS & ICMR water standards. On the basis of results obtained for water from all Bore wells within the permissible limit while total hardness of five village Bore well samples were above the permissible limit.***
Keywords: Physico-chemical, Nutrients, Heavy Metals, Parameters, Water Quality

I. INTRODUCTION

Water is essential for plant and animal life; it is our best solvent. Water pollution is nothing but the deterioration of its quality as a result of various human activities. From WHO survey it was found that nearly 60% of diseases in Asian countries are water borne diseases (Foster and Bronstert, 2009). The natural elements which cause water pollution is gases, soil, minerals, humus materials, waste created by animals and other living organisms present in water (Lokhande and Kelkar 1999)Water is the important constituent of life support system. No one can live and even dream of life without water. Today, nearly 40 percent of the world's food supply is grown under irrigation, and a wide variety of daily life processes depends on water (Dhaka, Bangladesh, 2000). The quality of surface waters is a very sensitive issue. Anthropogenic influences (urban, industrial and agricultural activities, increasing consumption of water resources) as well as natural processes (changes in precipitation inputs, erosion, weathering of crustal materials) degrade surface waters and impair their use for drinking, industrial, agricultural, recreation or other purposes (Carpenter, 1998; Jarvie, 1998 ground water, and marine and coastal waters support all living things including human beings. Though water is available in the universe in huge quantity in the order of 1400 x106 km3, only 3% of the waters in the universe are fresh water. Among the fresh waters, only about 5% of them or 0.15% of the total world waters are readily available for beneficial use. The total water resource available in India is 1850 km3, which is roughly 4% of the world's fresh water resources (EPA-PWD,2001).

II. MATERIAL AND METHODS

A. Collection of samples

Bore well water samples were collected from five villages of vadugapalayam, pothiyampalaym, ponnandampalayam, sellapampalayam and kaniyur village at coimbatore during June-November 2015 in the plastic containers plastic container and brought to the laboratory for further analysis.

B. Analysis of Physico-chemical Parameters

Physico-chemical parameters were analyzed by using standard methods as suggested in APHA(1998), Parameters like pH, E.C., were analyzed at the sampling site itself. The DO was fixed in the BOD bottle at the site and brought to the laboratory for analysis by Wrinklers method. All the physico-chemical parameters were analyzed within 2 days and Compared with WHO (1963), BIS (1991) and ICMR (1975) drinking water standards.

III. RESULTS AND DISCUSSION

The results obtained through analysis of water samples from Bore wells of five villages (vadugapalayam, pothiyampalaym, ponnandampalayam, sellapampalayam and kaniyur)are given in below Table 1.Comparative physico-chemical parameters ofBore well water samples has been made with WHO (1963), BIS (1991) & ICMR (1975)drinking water standard in Table 2. During the study period, all the water samples were collected with water temperatures. However, values of air and water temperatures ranged from 200 to240 C and 190 to 230 C respectively. Both the air and water temperature were maximum at Station 5 and minimum at Station 1. The pH values were ranged from 6.9 to 8. 20. All samples were within the permissible limit. However, higher values of pH hasten the scale formation on water heater and reduce the germicidal potential of Chlorine (Mahapathra and Purohit, 2000). There was decline of pH atStation 1 and inclined at Station 5.Electric conductance of water was due to the presence of soluble salts and other ionic species which acts as conducting substance. The conductance values for the samples were ranged from 1.390mmho/cm to 1.674 mmho/cm. Minimum EC was recorded at Station 1 while maximum at Station 5.Carbonates and bicarbonates are main constituents which form alkalinity in water. In the present study, alkalinity of water samples ranged between 85 mg/l to 102mg/l, which were within the permissible limit. During study period, highest alkalinity was noted at Station 5 while lowest alkalinity was recorded at Station 2. Total Hardness values were ranged from 470 mg/l to 802 mg/l. Hardness of water is due to the presence of certain salts of Calcium, Magnesium and other heavy metals (Jain 1998). If hard water is used for drinking it causes undesirable effect on digestive system (Pitchammel et al., 2009). The value of total hardness was minimum at Station 1while maximum at Station 5. The total hardness was exceeding acceptable limit at all sites except Station 1. The values of total hardness at Station 1 are also close to cross the permissible limit. Calcium Hardness values varied were from 110.09 mg/l to 198.36 mg/l. All values were within the permissible limit except sample from Station5. Higher values of calcium were observed at Station 5 while lower at Station 1. Magnesium hardness values were ranged from 79.46mg/l to 120.34mg/l. Samples from Station 2, Station 4 & Station 5 were within the permissible limit whereas Station 1 and Station 3 were exceeding the permissible limit. Higher value of magnesium was noted at Station 5 and lower at Station 3. The concentration of dissolved oxygen was fluctuated from 5.6 mg/l to 8.9 mg/l. Dissolved Oxygen values were decreases in summer due to increases in temperature which increases catabolic activity leading to utilization of oxygen. Similar observation was made by Gonzalves and Joshi (1996) based on WHO (1963) criteria. Chloride values were varied between 149.36 mg/l and 320.15mg/l. The presence of higher values of chloride was due to the human interference. Maximum chloride was reported from Station 5 while minimum at Station 1. Except S1, all samples were crossing acceptable limits. Excess chloride in drinking water may induce heart failure (Brooker and Johnson, 1984) and hypertension (Hussain and Ikbal, 2003).Fluoride values were ranges from 0.05 to 0.09 mg/l & were within permissible limit for human consumption and agriculture use as per the International standards. Spatial variation was observed negligible for fluoride values. According to Tailor and Chande (2010), excess amount of fluoride causes dental fluorosis, skeletal fluorosis and non-skeletal fluorosis.The Sodium content in the water sample was varied from 68 mg/l to 85 mg/l. All samples are within the permissible limit. Content of sodium was noted lower at Station 1 while higher at Station 5. The high concentration of Sodium is due to addition of municipal sewage under low flow conditions. Potassium content in the water samples were ranged from 8 to 55 mg/l. Sampling Station 5 has the highest Potassium content while lowest at Station 5. The highest value of phosphate was observed at Station 5 with 5.1 mg/l while lower values were at Station 1 with 0.0825 mg/l. All samples were found to be within the permissible limit. Zinc is an essential element for the effective function of various enzyme systems. The child required 0.3 mg/l of zinc per every Kilogram of Body weight. A deficiency of which might causes retardation of growth. Besides the growth retardation, zinc deficiency may also lead to immaturity and anemia (Kakati, 2012). In the present investigation, content of copper at all the samples were found to below permissible limit of 1.5 mg/l (BIS 10500:1991), with maximum value of 0.015 mg/l and minimum value of 0.01 mg/l. Copper is an essential element in human metabolism. It is an integral part of number of enzymes and proteins which also cause staining of laundry and sanitary ware (WHO 1984). The present investigation shows all the samples were found below detectable limit for iron except S5 with 2.120 mg/l. Sulphate content ranges from 56 mg/l to 146 mg/l. All samples were within permissible limit. Higher value was observed at Station 5 while lower at Station 1, Station 2 and Station 3, Station 4. The weathering and pollution are the chief source of SO_4^{2-} in ground water.

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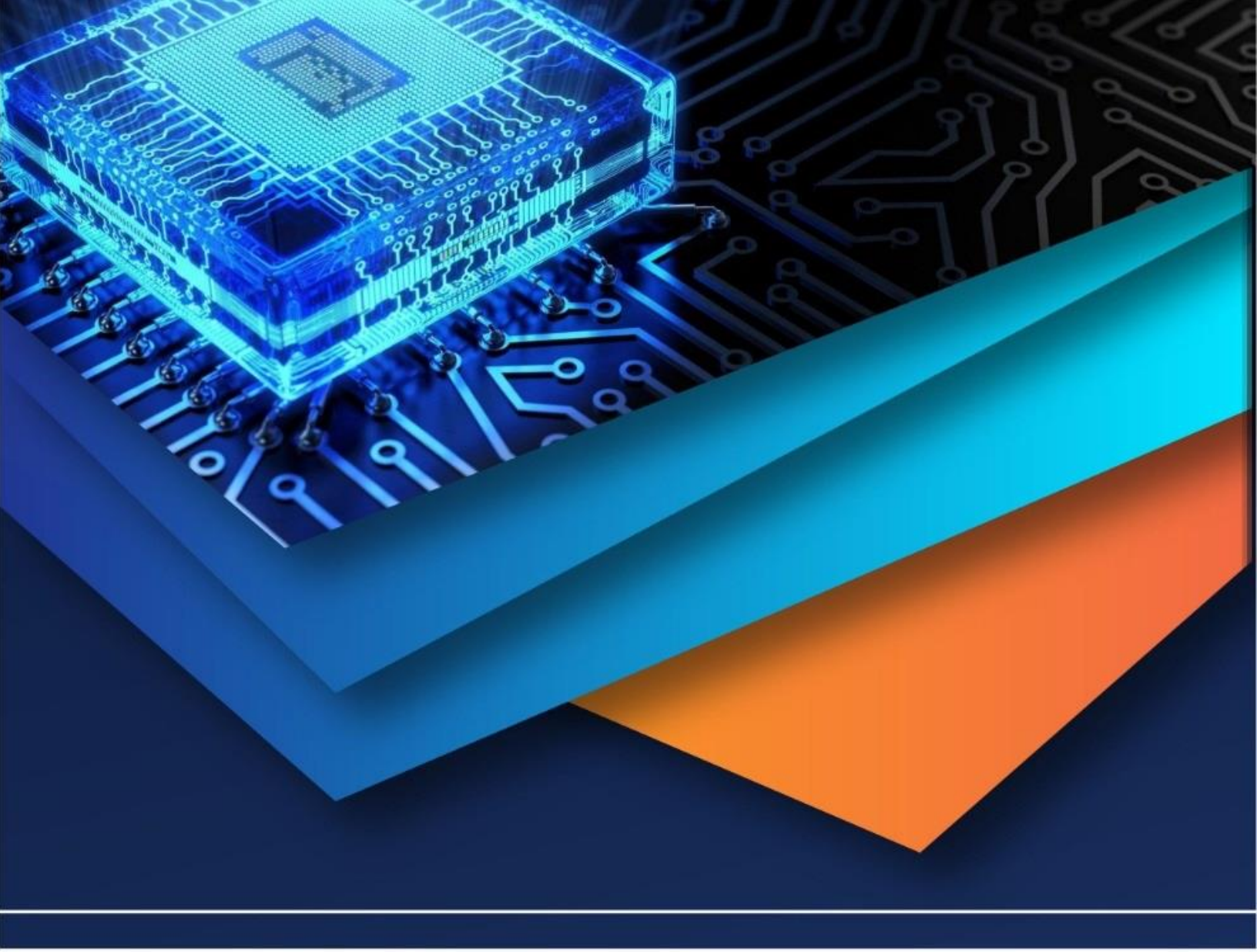

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