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A Comparative Assessment of the Physico-Chemical and Microbial Trends in Njaba River, Niger Delta Basin, Southeastern Nigeria

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ABSTRACT

Water quality monitoring at five (5) different gauge stations on the course of Njaba River was undertaken to understand the variability of the physico-chemical and microbial contents of the river water within a specified period of time (2003-2008). Collected water samples were analyzed using Atomic Absorption Spectrophotometer (AAS), Digital Meters and Standard Plate Counts. Results of the analyses indicated that average pH, electrical conductivity and the Total Dissolved Solids (TDS) of the Njaba River in 2003 were 6.3, 22 $\mu\text{S}/\text{cm}$ and 13.5 mg/l, respectively. Mean values in 2008 for the same parameters were 6.4, 24.4 $\mu\text{S}/\text{cm}$ and 14.7 mg/l, respectively. Mean concentrations of analyzed cations (Ca^{2+} , Mg^{2+} , Na^{+} and K^{+}) in 2003 were 4.10, 0.15, 5.00 and 1.20 mg/l, respectively, and that obtained for same parameters in 2008 were 4.40, 0.18, 6.40 and 1.30 mg/l, respectively. The mean concentrations of analyzed anions (HCO_3^{-} , SO_4^{2-} , Cl^{-} and NO_3^{-}) in 2003 were 20.0, 4.0, 1.30 and 0.20 mg/l, respectively and in 2008 the mean concentrations were 24.5, 4.20, 1.60 and 0.22 mg/l, respectively. Characterization of the river water followed the trend: $\text{Na}^{+} > \text{Ca}^{2+} > \text{K}^{+} > \text{Mg}^{2+}$ (for the cations) and $\text{HCO}_3^{-} > \text{SO}_4^{2-} > \text{Cl}^{-} > \text{NO}_3^{-}$ (for anions), showing the Njaba River is NaHCO_3 water. Mean concentrations of Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) of the river water were 7.2 and 2.2 mg/l, respectively in 2003, and 8.0 and 4.0 mg/l respectively, in 2008. Total Coliform Counts of the river water in 2003 ranged from 70 - 90 cfu/100ml with a mean value of 80 cfu/100ml, while the counts in 2008 ranged from 100 - 120 cfu/100ml with a mean value of 110 cfu/100 ml. Calculated Pollution Index (PI) slightly increased from 0.72 in 2003 to 0.73 in 2008. These water quality determinants revealed gradual rise in the concentrations of the respective physico-chemical parameters and bacteriological constituents of the Njaba River water. Sodium Adsorption Ratio (SAR) of 1.37 in 2003 and 1.54 in 2008, however, indicated that the river remained excellent for irrigation purposes. Except for the observed low pH and poor bacteriological quality, all other measured parameters of the Njaba River water conformed to the World Health Organization (WHO) standards for safe drinking water. The generally decreasing low pH value and progressively increasing Coliform Counts and nutrient contents (although still low) were the major environmental problems observed in the Njaba River water. These problems are essentially associated with increased anthropogenic activities on the Njaba River Watershed within the period in focus.

KEYWORDS

Concentration, Variability, Characterization, Water Quality, Watershed, Pollution

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