



COMPARATIVE ANALYSIS OF PHYSICO-CHEMICAL CHARACTERISTICS OF ABU AND ZARIA DAM

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ABSTRACT

The physical and chemical parameters of ABU Dam and Zaria Dam were carried out between September and October 2009. The results obtained in the two water bodies were temperature 27.7 °C, pH (7.5 and 7.3), dissolved oxygen (5.8 mg/l and 5.0 mg/l), biochemical oxygen demand (1.74 mg/l and 2.16 mg/l), alkalinity (58 mg CaCO₃/l and 49 mg CaCO₃/l) PO₄-P (2.47 mg/l and 1.59 mg/l) NO₃-N (3.67 mg/l and 3.47 mg/l), conductivity (54.70 μs⁻¹ and 42.48 μs⁻¹), total hydrocarbon (TH) (47.66 mg/l and 48.00 mg/l) and total dissolved solids (32.68 mg/l and 25.35 mg/l) respectively. There was no significant difference in the mean values of the parameters (P>0.05) except conductivity and total dissolved solids. The water bodies were found to be neutral with high conductivity. All the properties in the water bodies were in conformity with international standards both for drinking and aquatic life.

INTRODUCTION

Clean water is the most essential need of humans and other life forms. Access to clean

and safe water for drinking is one of the fundamental problems facing many people across world in fact, safe drinking is even harder to find especially in industrially developed countries such as the U.S. Most tap and well water in the U.S. now are not safe for drinking due to heavy industrial and environmental pollution. This study is based on the above facts. The physical and chemical properties of water greatly influence the uses, distribution and richness of flora and fauna (Courtney and Clement 1998). As such, techniques of using physical and chemical properties to assess water bodies are essential. The water bodies were assessed to ascertain their suitability for drinking since it serves as source to water supply to the inhabitants and also find out if it could be utilized for fish culture. Environmentally sustainable water quality and aquatic resources are critical to the health and well being of humans and other life forms.

STUDY AREA

The study was carried out in Zaria, Kaduna State of Nigeria. It is located at Latitude 11^o4'0" North, 7^o 42' 0" East. ABU Dam is situated in the University premises while Zaria Dam is located in Zaria city. Zaria is situated in the northern Guinea Savanna Zone with a tropical continental climate possessing distinct rainy and dry seasons.

MATERIALS AND METHODS

The water samples were collected fortnightly between 8.a.m and 12 noon on each sampling day. Standard methods from

APHA, 1985 were adopted for this study. Temperature was measured using mercury in glass thermometer, by immersing the thermometer in the water sample, while electrical conductivity and pH were measured using Hanna model H1991300 and pH meters model WTWLF 318. Winkler method was adopted for DO and BOD while alkalinity was determined by titrimetric method. Phosphates and Nitrates were determined using brucine calorimetric method. The data collected were subjected to Analysis of variance (ANOVA) and Pearson Correlation Test (PCT) to find the different levels of significance.

RESULTS

Results of the mean values of the physico-chemical parameters of the two freshwater bodies are given in Table 1. There was no significant difference ($P > 0.05$) in all the parameters except conductivity and TDS which had significant difference ($P < 0.05$) between the two values.

Comparison between values obtained from the water bodies with international standards are presented in Table 2. The table shows that the two bodies are suitable for drinking and can support aquatic life.

DISCUSSION

The results of physico-chemical analysis revealed the inherent properties of the water bodies. All the properties are in line with Federal Environmental Protection Agency (FEPA) standard for drinking and aquatic Life. And most of the parameters were either above or below recommended standard for drinking and aquatic Life (Table 1). The temperatures were the same for the two water bodies (27.7°C). This temperature value can support Aquatic Life according to FEPA water standards and agrees with the finding of Chia, (2007) where he obtained the same value for ABU Dam and Aviation quarry dam. The pH values were neutral (7.5 and 7.3) as such,

the waters were suitable for drinking and aquatic Life. But Unaman and Edokpayi (2009), recorded a slightly acidic pH for Ukhun Pond in Edo state. This difference may be due to location difference. Ekpoma is located within rainforest zone while Zaria is in the northern guinea savanna. Antoine and Al-saadi (1982) reported that a pH value of 6.5 – 8.5 is acceptable for inland waters. The dissolved oxygen concentrations in the water bodies were 5.8 and 5.0 for ABU Zaria Dam respectively. FEPA recommended 6 – 8 for aquatic life (Table 2). The concentration of dissolved oxygen in these water bodies fell within the range necessary to support aquatic life and also for drinking.

The Electrical Conductivity (EC) of the water bodies ($54.70 \mu\text{s}^{-1}$ and $42.46 \mu\text{s}^{-1}$) may be as result of high concentration of solid and dilution of effluent being washed into the upstream. The difference in the EC of both water bodies may be due to the source of the water, dissolved substances and the variation in the activities around the water bodies could be responsible for the observed difference in TDS and EC (Chia, 2007). Langenegger (1994) observed that EC is not a good indication of water quality with regard to health hazard. Phosphates have been identified as an important element in the biological productivity. The highest value of phosphate in ABU Dam may be as a result of fertilizer from and detergent which flow from the upstream into the water body. The high value of Nitrate is due to high concentration of plankton in the water bodies Maih *et.al* (1994) stated that the deposition of silt and organic matter favour the growth of phyto and zooplankton. In conclusion the physico-chemical characteristic revealed that both ABU and Zaria Dam is suitable for drinking and Fish Culture. It is advised that certain modifications should be done such as providing outlet and also restricts farming activity and laundry around the water area.

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Table 1: Mean values of physico-chemical parameters obtained from two water bodies in Zaria

Water bodies	Parameters									
	TEMP	pH	DO	BOD	COND	TDS	ALK	PO ₄	NO ₃	TH
ABU DAM	27.7 ± 0.02	7.5 ± 0.01	5.8 ± 0.02	1.74 ± 0.02	45.70 ± 0.01	32.68 ± 0.05	58 ± 0.09	2.47 ± 0.01	3.67 ± 0.01	44.66 ± 0.01
ZARIA DAM	27.7 ± 0.03	7.3 ± 0.01	5.0 ± 0.08	2.16 ± 0.01	42.48 ± 0.08	25.35 ± 0.06	49 ± 0.02	1.59 ± 0.03	3.47 ± 0.07	48.00 ± 0.01

Table 2: Comparison between values obtained from the two water bodies in Zaria with international standards

Parameters	Freshwater Bodies		Drinking	Aquatic life
	ABU Dam	Zaria Dam		
Temp(⁰ c)	27.7	27.7	-	20 – 33
pH	7.5	7.3	6.5 – 8.5	6.0 – 9.0
DO (mg/L)	5.8	5.0	7.0	6 -8
BOD (mg/L)	1.74	2.16	0	4.0
ALK (mg/L)	58	49	-	-
PO ₄ -P (mg/L)	2.47	1.59	> 5	Ns
NO ₃ -N (mg/L)	3.67	3.47	10	Ns
COND(μ ⁵⁻¹)	54.70	42.48	> 10	-
TH(mg/L)	47.66	48.00	-	-
TDS(mg/L)	32.68	25.35	500	-