

## EFFECT OF BIO-DISC EXPOSURE ON SOME PHYSICO CHEMICAL PARAMETERS OF WATER FROM THREE DIFFERENT SOURCES

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### ABSTRACT

The effect of Bio disc on physico-chemical parameters from three water sources; borehole, river and well were assessed. Each water sample was energized by pouring it gently over the Bio-disc, after which it was returned into the containers and allowed to stand on the bio- disc for six hours, the non-energized water samples were taken as the control. The physico-chemical parameters were determined using standard methods for water analyses. The highest value for pH ( $7.24 \pm 0.05$ ) was observed in unenergized river water, while the least value ( $5.89 \pm 0.01$ ) was observed in unenergized well water, the highest dissolved oxygen ( $4.40 \pm 0.1$ ) was observed in non energized river water and the least dissolved oxygen ( $3.13 \pm 0.04$ mg/l) was observed in energized river water and the highest conductivity ( $259.77 \pm 30.11$ ) was observed in non energized river water and the least conductivity ( $47.73 \pm 0.23$ ) was observed in non energized well water while highest temperature value of  $34.76 \pm 0.06$  was recorded in unenergized borehole sample with a minimum value of  $28.27 \pm 0.27$  observed in well water sample, these values were all within World Health Organization and Standard Organization of Nigeria limits except in conductivity of non energized river. The result of the study indicated that the non energized river water sample recorded highest values of pH and dissolved oxygen and were still within permissible limit hence; do not pose any threat to aquatic organisms and humans. This further infers the relative safety of the unenergized river water for aquaculture and human activities.

**Keywords:** Physico-chemical, Water, Energized, Unenergized, Borehole, River, Well.

### INTRODUCTION

Natural water contains different types of impurities which are introduced into aquatic system by different ways such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere and from several human activities, including washing and the use of metal based materials (Ipinmoroti and Oshodi 1993; Adeyeye 1994; Asaolu *et al.*, 1997). Water resources are of critical importance to both natural ecosystem and human development. The healthy aquatic ecosystem is dependent on the physico-chemical and biological characteristics (Venkatesharaju *et al.*, 2010). The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physico-chemical parameters; biological characteristics and heavy metals present (Itodo and Itodo, 2010). Analyses of physico-chemical parameters involve the measurements of various

physical and chemical properties of water, mostly temperature, salinity, pH, electrical conductivity, total dissolved solid and hardness (Adefemi *et al.*, 2010).

Bio-Disc is a natural energy generating device. The energy created specifically rejuvenates molecular structures in all liquids. The molecular structure causes any liquid to become more hydrated, taste better and extend shelf life. If placed in a refrigerator the Bio-Discs' energy frequency has been reported to extend the shelf life of all liquids, meat and fruit; the renewed molecular chains are similar to those found in healthy natural spring water ([www.amezcau.com/certification.html](http://www.amezcau.com/certification.html)).

This study was therefore, aimed at assessing the effect of bio disc on some physico-chemical parameters of water obtained from three sources of borehole, river, and well.

## **MATERIALS AND METHODS**

### **Study Area**

The study was conducted at Kebbi State University of Science and Technology, Kebbi State, Nigeria, which lies between latitudes 12° 16' and 12° 42' North and longitudes 4° 27' and 4° 6' E.

### **Sample collection**

The water samples were collected from the pump borehole, river and well sources at different locations. The water samples were collected using differently labeled 2 liters capacity plastic bottles with a screw cap which were initially washed with distilled water and later rinsed thrice with the water samples at the point of collections. Borehole water sample was collected from within Kebbi State University of Science and Technology Aliero, while allowing the borehole tap to run for 15 minutes before collecting the sample.

The river sample was collected from Ka River a tributary of river Sokoto at a location characterized by intense domestic activities. Sample collection was achieved by deepening the plastic bottle into the river. Whereas, well water sampling was conducted in a densely populated area (Onions market, Aliero), using the locally made water fetcher. The samples collected were appropriately labelled and immediately conveyed to the laboratory and stored in refrigerator before analyses (Rao *et al.*, 2004).

## **EXPERIMENTAL DESIGN AND LAYOUT**

### **Energizing the water samples**

A bottle from each water sample was gently poured over the bio-disc in a wider plastic bowl, after which the water was poured back into the sampling bottle and allowed to stand on the bio disc for 6h, thus energizing the water. The physico-chemical parameters of the energized and the unenergized water were conducted at the physical laboratory Usmanu Danfodio University Sokoto.

### **Determination of physico-chemical parameter**

Dissolved oxygen and temperature was determined using hand held Exstik instrument (Exstik 11 CE 181519 made in Taiwan). PH was measured using hand held pH meter (model 350) it

has 2 point calibration and automatic buffer recognition with manual override. The conductivity was measured using hand held conductivity meter Oaklon (conductivity/TD8% meter con 11 series).

### Statistical Analysis

Data obtained were subjected to analysis of variance (ANOVA) to test the effect of Bio disc on the physico-chemical parameters of water samples. Where there was significant difference, the means were separated using Duncan's Multiple Range Test at 0.05 probability level with the aid of Statistical Package for Social Scientists SPSS 20.

### RESULT

Table 1 presents the physico-chemical parameters energized and unenergized borehole water. The result indicated maximum dissolved oxygen value of  $4.40 \pm 0.10$  mg/l at a corresponding lowest temperature of  $28.47 \pm 0.06^\circ\text{C}$  in energized borehole water which also recorded a high conductivity of  $110.87 \pm 0.29$ . Table 2 shows the physic-chemical parameters of energized and unenergized. Highest pH  $7.24 \pm 0.05$  was observed in unenergized river water with highest dissolved oxygen value of  $6.40 \pm 0.16$  mg/l at a corresponding highest temperature value of  $32.80 \pm 0.10$  mg/l. and a lowest value of  $3.13 \pm 0.04$  mg/l in energized river water. Similarly, unenergized river water was observed to have highest conductivity value of  $259.77 \pm 30.11$   $\mu\text{S/cm}$  and a lowest value of  $136.17 \pm 2.08$   $\mu\text{S/cm}$  in energized river water. Table 3 indicates the physic-chemical parameters of energized and unenergized well water. Lowest pH values of  $5.89 \pm 0.10$  and  $6.33 \pm 0.13$  were observed in unenergized and energized well water samples respectively with corresponding lowest dissolved oxygen values of  $3.69 \pm 0.46$  mg/l and  $3.52 \pm 0.14$  mg/l. It also recorded lowest conductivity value of  $47.73 \pm 0.23$   $\mu\text{S/cm}$  in unenergized sample.

**Table 1: Physico-chemical parameters of energized and unenergized borehole water**

Physico-chemical parameters	Energized water		Unenergized water		WHO(mg/l) (2006)	SON(mg/l) (2007)
	Range	Mean	Range	Mean		
pH	6.51-6.91	6.65±0.22	6.34 – 6.53	6.39±0.13	6.5-9.5	6.5-8.5
DO (mg/L)	4.42 – 4.49	4.40±0.10	4.13 – 4.33	4.16±0.16	12.00	5.00mg/l
Temp (°C)	28.4 – 28.25	28.47±0.06	34.7 – 34.8	34.73±0.06	-	Ambient
Conductivity (µS/cm)	111.2- 111.7	110.87±0.29	109.9 -110.9	110.53±0.55	-	1.00µS/cm

**Table 2: Physico-chemical parameters of energized and unenergized river water**

Physico-chemical parameters	Energized water		Unenergized water		WHO(2006)	SON(2007)
	Range	Mean	Range	Mean		
pH	6.86 – 6.99	6.93±0.07	7.21 – 7.29	7.24±0.05	6.5-9.5	6.5-8.5
DO(mg/L)	3.08 - 3.16	3.13±0.04	6.28 – 6.58	6.40±0.16	12.00	5.00mg/l
Temp(°C)	32.7 – 32.8	32.80±0.10	30.6 – 31.6	31.00±0.53	-	Ambient
Conductivity(µS/cm)	134.5 – 135.5	136.17±2.08	234.2– 293.0	259.77±30.11	-	1.00µp/cm

**Table 3: Physico-chemical parameters of energized and unenergized well water**

Physico-chemical	Energized water		Unenergized water		WHO(2006)	SON(2007)
parameters	Range	Mean	Range	Mean		
pH	6.20 – 6.45	6.33±0.13	5.80 – 6.00	5.89±0.10	6.5-9.5	6.5-8.5
DO(mg/L)	3.36 – 3.60	3.52±0.14	3.80 – 4.08	3.69±0.46	12.00	5.00mg/l
Temp(°C)	28.1 – 28.50	28.27±0.27	34.4 – 34.5	34.47±0.06	-	Ambient
Conductivity(μS/cm)	52.10– 53.03	53.03±0.95	47.6 – 48.0	47.73±0.23	-	1.00μp/cm

**Table 4: Comparison between the physico-chemical parameters of Borehole, River and Well waters**

Physico-chemical parameters	Sources of water					
	Borehole		River		Well	
	Energized	Unenergized	Energized	Unenergized	Energized	Unenergized
pH	6.653±0.022 <sup>c</sup>	6.387±0.127 <sup>b</sup>	6.930±0.066 <sup>d</sup>	7.237±0.0462 <sup>e</sup>	6.333±0.126 <sup>b</sup>	5.893±0.100 <sup>a</sup>
DO (mg/l)	4.400±0.101 <sup>c</sup>	4.156±0.162 <sup>c</sup>	3.127±0.162 <sup>a</sup>	6.400±0.042 <sup>d</sup>	3.520±0.139 <sup>ab</sup>	3.687±0.460 <sup>b</sup>
Temp (°C)	28.467±0.057 <sup>a</sup>	34.733±0.057 <sup>d</sup>	32.800±0.100 <sup>c</sup>	31.000±0.529 <sup>b</sup>	28.267±0.208 <sup>a</sup>	34.467±0.057 <sup>d</sup>
Conductivity (µS/cm)	110.867±0.289 <sup>b</sup>	110.533±0.55 <sup>b</sup>	136.167±2.081 <sup>c</sup>	259.767±30.110 <sup>d</sup>	53.033±0.950 <sup>a</sup>	47.733±0.230 <sup>a</sup>

Mean in row with same letter are not significantly different ( $p \leq 0.05$ )

## DISCUSSIONS AND CONCLUSION

It was observed in this study that the physico-chemical parameter (conductivity, dissolved oxygen, temperature and pH) of the water samples were within the acceptable limit of World Health Organization (WHO) and Standard Organization of Nigeria (SON) with the exception of energized and unenergized well water that recorded values of pH lower than the recommended standard values. This is in agreement with the finding of Akoto *et al.*, (2008) who observed that the pH, conductivity and dissolved oxygen were within the World Health Organization (WHO) limit. Medudhula *et al.*, (2012) also reported that the conductivity, dissolved oxygen and pH of deep reservoirs were within the World Health Organization (WHO) acceptable limit. Fella *et al.*, (2013) observed that the pH and conductivity of river chiffon at Blida North West of Algeria were within the World Health Organization (WHO) permissible limit. In contrast, Asonye *et al.*, (2006) and Olatunji *et al.*, (2011) reported higher values of conductivity and pH above the World Health Organization (WHO) and European Economic Community (EEC) permissible limit. In conclusion the study showed that bio-disc treatment had significant ( $p < 0.05$ ) effect on the physico-chemical parameters of water from all, the three sources with the exception of dissolved oxygen and conductivity values for borehole and conductivity value for well water which were statistically similar ( $p > 0.05$ ) between energized and unenergized samples.

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