Physicochemical Analysis of Ogun River (Water Samples) Within Two Locations (Akin-Olugbade and Lafenwa) In Abeokuta, Ogun State, Nigeria.

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Abstract: *Physicochemical analysis were carried out on water samples from Ogun river collected from Lafenwa (a densely populated area) and Akin-Olugbade (a sparsely populated area) in Abeokuta Ogun state, Nigeria. The results obtained showed that parameters like Alkalinity, pH, acidity, Chloride, Magnesium and Calcium were in the normal range and Chromium, Lead, Nickel, Zinc and Cadmium contents were below detection limit. Parameters such as nitrite, total solid, total suspended solid and total dissolved solid, Manganese, Sodium, Potassium, Iron and Copper were found to be out of desirable levels.*

The turbidity values ranges between 67.35 and 76.81. Total solid, total suspended solid and total dissolved solid ranged 884.00 – 896.00, 446.00 – 448.09; 438.00 – 448.00 mg/l respectively.

The Alkalinity ranges from 42.90 mg/l (at Lafenwa) to 43.60 mg/l (at Akin-Olugbade). The acidity values are between 4.60mg/l and 3.60 mg/l. The Chloride was in samples as 8.98mg/l(at Akin-Olugbade) and 9.86 (at Lafenwa) Samples from Akin-Olugbade have the least value of (36.10 mg/l) for total hardness while samples from Lafenwa had the highest value (38.10mg/l), pH values ranges between 7.60 and 7.72. The Nitrite contents observed for all samples are above the standards of SON, NAFDAC and WHO, samples from Akin-Olugbade has a mean value of 0. 65mg/l and Lafenwa 0.69mg/l, Calcium content is present in all the samples, 22.10mg/l for Akin-Olugbade and 33.10 for Lafenwa. Magnesium content is 14.10mg/l for Akin-Olugbade and 5.10mg/l for Lafenwa, Manganese, Sodium, Potassium, Iron and Copper contents observed for all samples were 289 ±27.60 – 466 ± 100, 74600 ± 624 - 77400 ±414 , 31300 ± 1.41 – 33200 ±1150, 13800 ± 185 – 16100 ±618, 61 ± 7.07 - 176 ±23.30 respectively.

The observations indicate a better quality for the river water, yet unsafe for some human activities except them are properly treated and screened.

Keywords: *Ogun River, physicochemical analysis, river water, water pollution, water quality*

I.   Introduction

Water is an important matter to all life both animals and plants. It can also be regarded as a universal solvent as it is capable of dissolving an enormous range of substances. River water in most developing countries serves as source of water to all life, in urban areas this water are treated by the water corporations or water plants before it becomes circulated around te cities but in most villages, there are inadequate infrastructure to treat the water so people feed directly and this has led to increase in water borne diseases. Most people in the world have no access to save drinking water and this has led to increase in water borne diseases which kill more than six million children every year [1].

Ogun River serves as source of water supply, and fishing zone for Abeokuta populace and all neighboring villages. In densely populated areas the river is used for bathing, washing and drinking. It also serves as a drain for mostly organic wastes from abattoirs located along the river's course. The river takes its source in Oyo State near Shaki at coordinates 8°41′0″N 3°28′0″E / 8.683333°N 3.466667°E and flow through Ogun State into Lagos State[2]. The river is crossed by the Ikere Gorge Dam in the Iseyin Local Government Area of Oyo State. The reservoir capacity is 690 million m^3 [3]. The reservoir abuts the Old Oyo National Park, providing recreational facilities for tourists, and the river flows through the park [4]. The Ofiki River, which also takes its source near Shaki, is the Ogun River's chief tributary, the Oyan River is another tributary [5].

Since Ogun water serves as the water source for Ogun state, it is crucial carrying out a periodical water quality assessment as a result of daily human activities around the water basin to achieve a more environmentally sound pollution control measures that eradicates the potential hazards associated with the use of contaminated water supply.

It is evident that human activities around this water must have accelerated changes in its quality. The aim of this research is to do a comprehensive analysis of Ogun River to determine the extent of pollution in the river.

II. Material and methods

2.1 Sampling

Water Samples were collected from Ogun River at Lafenwa (a densely populated area) 7^0 10' 0" North, 3^0 3' 0" East and Akin-Olugbade (a sparsely populated area) 7^0 9' 0" North, 3^0 19' 30" East in Abeokuta Ogun state, Nigeria. Plastic sample containers (1.5l) were washed with non-scented liquid detergent, rinsed with water and sterilized. The water samples were collected from a depth of 0.5m deep and collected up to the top with the mouth facing slightly upward in the direction of the current. The bottles were properly labeled; the samples were kept in the refrigerator at 4^0C prior to the analysis

2.2 Chemical Analysis

The physicochemical parameters were determined using standard methods of water analysis [6] which included suspended solids, total solids dissolved solids, volatile solids, turbidity, pH, acidity, and alkalinity.

2.3 Instrumental Analysis of the sample

100ml of each of the sample was measured into a 250ml Erlenmeyer flask and acidified with 2M HNO_3. The mixture was swirl to mix properly, evaporated to dry on a steam bath and cooled.

25ml concentrated HNO_3 concentrated HNO_3 was added to the cooled residual bath. The flask was placed in a hot plate and the acid evaporated to small volume taking care that there was no spattering in the process. 25ml concentrated HNO_3 and 10ml H_2O was added repeatedly each time completed by repeating the above procedure, and the residue in the flask was white.

The following metals were analyzed using Bulk 110 model of Atomic Absorption Spectrophotometer: Nickel, Zinc, Chromium, Lead and Cadmium, Iron, Manganese, Copper, Sodium, Potassium

III. Result & Discussion

The physiochemical analysis of the water samples (Akin-Olugbade and Lafenwa) showed that Ogun river in which all rivers and streams in the city flow into, and which serves as source of water supply, and fishing zone for Abeokuta populace has its results as shown in the tables 1 to 3.

Table 1 presents the physical parameters of the water samples. The result showed that the temperature ranged between 27.0– 32. 0^oC. Temperature is an important parameter for aquatic environment; it is governed by physical, chemical and biochemical properties.

The color observed was brownish. The brownish color of the water samples corroborate the high values of the total solids and the turbidity values (67.35 and 76.81) which indicated that there were particle suspensions that gave the apparent color to the analyzed samples.

The mean values of total solid, total suspended solid and total dissolved solid shown in table 4 ranged 884.00 – 896.00, *446*.00 – 448.09;   438.00 – 448.00 mg/l respectively. The values of total solid obtained for Akin-Olugbade and Lafenwa were above NAFDAC, SON and WHO standards (WHO, 2003 and SON , 2003) which indicated that the water sample contained dissolved solids and residues which were beyond the maximum allowable limit of the world Health Organisation standard with Lafenwa having the highest value. This may be due to various activities (Trading in Lafenwa Market, construction exercises, automobile etc) carried out at Lafenwa since its more populated than Akin- Olugbade.

Table 2 presents the chemical parameters. The mean values of the chemical parameters shown indicates that the Alkalinity range from 42.90 (at Lafenwa) -43.60 (at Akin-Olugbade) and are still within the standards of NAFDAC, SON and WHO, so these fall below the desirable level 100mg/l for drinking water. This can be traced to pollution and domestic activities which had taken place around the river.

The acidity value (4.60mg/l & 3.60 mg/l) indicated that the sample had being polluted by some hydrolyzing salts like iron II. The Chloride was in samples as 8.98mg/l(at Akin-Olugbade) and 9.86 (at Lafenwa) and are below 100mg/l recommended for portable water. Samples from Akin-Olugbade has the least value (36.10 mg/l) for total hardness while samples from Lafenwa had the highest value (38.10mg/l), these values are In line with the WHO,SON and NAFDAC recommendations,(100mg/l). pH values 7.60 -7.72 were within the permissible level range of 6.50-8.50 NAFDAC and SON (2003).

The Nitrite contents observed for all samples are above the standards of SON, NAFDAC and WHO, samples from Akin-Olugbade has a mean value of 0. 65mg/l and Lafenwa 0.69mg/l, these have Nitrite contents which are higher than the recommended value 0.02mg/l but still lower than WHO Maximum Permissible Standards which is 3mg/l. these nitrite level may be due to the food added to the river by domestic activities such as market (where traders wash their goods). All proteins contain nitrogen, as do a wide variety of other biomolecules. When metabolized, much of this nitrogen can end up in the form of ammonia (NH3). There are bacteria that consume the ammonia and their waste product is nitrite (NO2).Calcium content is present in all the samples, 22.10mg/l for Akin-Olugbade and 33.10 for Lafenwa. Calcium carbonate is used by plankton and molluscs in the oceans to build shells. When these organisms die, they sink to the bottom of the ocean. The soft

parts of the organisms decay, but the calcium carbonate shells keep building up in layers of sediment that eventually turn to stone.

Magnesium content is *14*.10mg/l for Akin-Olugbade and 5.10mg/l for Lafenwa, which falls within the standard (20mg/l).Chromium, Lead, Nickel, Zinc and Cadmium contents were below detection limit in all samples. Manganese, Sodium, Potassium, Iron and Copper contents observed for all samples, were all above the standards of SON, NAFDAC and WHO. This may be as a result of erosion of salt deposits and these metals bearing rock minerals, naturally occurring brackish water of some aquifers, salt water intrusion into the river areas, infiltration of the river contaminated by road salt, irrigation and precipitation leaching through soils high in sodium and potassium around the river or soils close to river that flow into Ogun river, pollution by sewage effluent and infiltration of leachate from landfills or industrial sites around the river. Auto body rust, engine parts, bearing wear and brake emissions from automobile outlets around the river basins could be responsible for the high values of Iron and Copper

IV.   Conclusion

This study assessed the parameters like temperature, pH, total suspended solid, total dissolved solid, alkalinity, nitrite, chloride, sodium, potassium, iron, zinc, chromium, lead in Ogun river to evaluate the water quality with respect to human activities around the river basin.

From this experiment and the various results, it can be safely concluded that it will only be possible to say that some physicochemical parameters were in the normal range and some like Chromium, Lead, Nickel, Zinc and Cadmium contents were below detection limit indicating better quality of the river water. Perhaps, few parameters like nitrite, total solid, total suspended solid and total dissolved solid, Manganese, Sodium, Potassium, Iron and Copper were found to be out of desirable levels making it unsafe for some human use. The effect of presence of total suspended solids is the turbidity due to silt and organic matter and the water high in suspended solid may be aesthetically unsatisfactory for bathing.

TABLE 1: MEAN VALUES OF PHYSICAL PARAMETERS

PHYSICAL PARAMETERS	AKIN-OLUGBADE		LAFENWA	
TEMPERATURE (^{0}C)	27.00		32.00	
APPEARANCE	Brownish		Brownish	
TURBIDITY	67.40	± 0.05	76.80	± 0.11
TOTAL SOLID (mg/L)	884.00	± 0.13	896.00	± 0.10
TOTAL DISSOLVED SOLID (mg/L)	438.00	± 0.05	448.00	± 0.07
TOTAL SUSPENDED SOLID (mg/L)	*446*.00	± 0.10	448.00	± 0.09

TABLE 2: MEAN VALUES OF CHEMICAL PARAMETERS

CHEMICAL PARAMETERS	AKIN-OLUGBADE		LAFENWA	
ACIDITY (mg/L)	4.60	±0.14	3.60	±0.13
ALKALINITY (mg/L)	43.60	±0.14	42.90	±0.13
TOTAL HARDNESS (mg/L)	36.10	±0.14	38.10	±0.13
NITRITE (mg/L)	0.65	±0.13	0.69	±0.12
CHLORIDE (mg/L)	8.98	±0.14	9.86	±0.13
IRON (mg/L)	*1.24*	±0.10	1.20	±0.09
pH at 20 ^{0}C	7.60	±0.01	7.72	±0.13

TABLE 3: MEAN VALUES OF METAL CONTENTS OF THE SAMPLES (mg /L)

ELEMENT	AKIN-OLUGBADE		LAFENWA	
Mg	*14*.10	*±0.14*	5.10	± 0.13
Na	77400	±414	74600	± 624
K	33200	±1150	31300	± 1.41
Fe	16100	±618	13800	± 185
Cu	176	±23.30	61	± 7.07
Cr	-		-	
Mn	*289*	±27.60	466	± 100
Pb	-		-	
Ca	22.10	±0.14	33.10	± 0.13
Ni	-		-	

Zn	-	-
Cd	-	-

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