Algae Composition and Physico- Chemical Paramaters of Awon Reservoir, Oyo State, Nigeria

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GJSFR-C Classification : FOR Code: 060799

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Abstract- The algae composition and physico-chemical parameters of Awon Reservoir were investigated for a period of four months (wet and dry seasons), this was done to examine the effect of seasonal variation on phytoplankton. The algae comprised a total of twenty-two species belonging to four divisions: bacillariophyta, chlorophyta, euglenophyta and cyanophyta. Navicula meniceculus, Gyrosigma scalproides, Closterium archerianum and C. dianae were the dominant species. The physico-chemical parameters determined were higher in the dry season than wet season. The values of physico-chemical obtained fell within the maximum allowable limit set by United Environment Protection Agency.

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I. Introduction

Algae have long been used to assess environmental conditions in aquatic habitants throughout the world(Kolkwitz and Marsson, 1908). More recently, the sensitivity of many algal species to pH has been employed to assess problems with acid deposition. (Smotto, 1995; battarbee etal., 1999). Government agencies throughout the world now use algae to monitor and assess ecological conditions in many types of aquatic ecosystems (e,g Weber, 1973; Dixit and Smol, 1992; Bahls, 1993; Whitton and Rott, 1996 Stevenson and Bahles, 1999 Akin-Oriola, 2003). Thus, characterization of algal assemblages has been important in environmental assessment, both in indicating changes in environmental conditions that impair or threaten ecosystem, health and in determining if algae themselves are causing problems. Algal biossessement complements physical and chemical data by providing corroborative evidence for environmental change.

Algological studies as well as physio-chemical parameters of lentic system in Africa are few. Related works include that of Battarbee etal., (1999) Briand etal (1978), Charles and Smol (1988), Dixit et al (1999) Healey and Hendzel (1980) and Akin-oriola (2003).

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In this study, data on the algal composition as well physico-chemical parameters are used to examine the prevailing conditions in Awon Reservoir. This study is carried out in order to contribute to the existing phycological information on Awon Reservoir.

II. Description of the Study Area

Awon Reservoir is located between 3.89º-3.91ºE of Greenwich meridian and Latitude 7.88º-7.90ºN of the equator and in the North western part of Oyo Township.The reservoir was constructed in 1962 mainly to supply portable water to the people of Oyo and its environs. It has a total storage capacity of $750m^3$and average depth of 1.8m. The temperature of the study ranges from 27-30^{0}C. The human activities going on around the reservoir include laundry, bathing, farming swimming and fishing.

III. Materials and Method

Collection of Samples

The collection of data was carried out during the four months sampling period (September-December 2011). Duplicate water samples were collected for both the chemical and biological analysis using one litre sampling plastic bottles each.

The algae water sample was centrifuged using cortex centrifuge at 1,500 RPM and the filtrate was decanted to produce 10ml concentrate and it was preserved in 4% formalin. The counts were made using Olympus student N107 microscope. Taxonomic keys employed in the identification included Patrick and Reimer (1966, 1975) and Prescott (1964) and 1982).

IV. Physico-Chemical Parameter

pH was measured using (model WTM pH 90) meter. The dissolved oxygen content was determined using oxygen meter, lead, phosphate and nitrate were determined using the methods described in APHA (1998).

V. Results

The algae floral consisted of twenty-two species belonging to four divisions namely bacillariophyta, cholorophyta, cyanophyta and euglenophyta.

Table 1 presents monthly changes in the algae species of Awon reservoir. The abundance of the phytoplankton varied according to the months during the study period. The division bacillariophyta was represented by dominant species such as *Navicula meniseculus, Gyrosigma scalproides Pinnularia otiensis and Tabellaria fenestrata. Navicula meniseculus* has the highest number of cell individual in September 2011 (30 cells per litre) while the lowest was recorded in November 2011 (8 cells per litre) (Table 1).Generally reasons for having dominant species of diatoms in the resevior may be attributed to high levels of nutrient (especially silicate) as well as temperature regime.

Among the chlorophyta, *Closterium archerianum and C. dianae* formed the dominant species. The highest number of cells was recorded for *Closteriumarcherianum*in September 2011. Cyanophyta was represented by *Anabaena spiroides* while *Euglena convoluta* represented division Euglenophyta (Table 1)

Table 1: Monthly changes of phytoplankton species (No. of Cell per litre)

Division	September 2011	October 2011	November 2011	December 2011
Bacillariophyta				
Navicula meniseculus	30	19	08	09
N. rhycocephala	02	01	01	01
N. exigua	03	02	01	01
N.decusis	04	01	02	03
N. crypotephala	03	02	03	04
Gyrosigma Scalproides	17	12	06	10
Gyrosigma sp	03	02	01	01
Pinnularia biceps	06	06	03	04
p. otiensis	10	08	02	05
p.debesii	08	02	04	01
Pinnularia spp	02	01	01	01
Tabellaria fenestrate	09	03	01	01
Tabellaria sp	01	03	04	03
Synedra sp	01	02	03	04
Achanthes ap	04	02	03	03
Aulacoseira sp	05	03	03	03
Nitszchia sp	03	02	01	02
Gomphonema sp	02	01	01	01
Chlorophyta				
Closterium archerianum	23	10	11	02
C. dianea	26	17	13	01
Cyanophyta				
Anabaena spiroides	01	01	03	02
Euglenophyta				
Euglena convolute	02	01	03	04

pH value ranged between 7,2-6.0, Dissolved Oxygen (mg1^{-1}) fluctuated between 5.6-4.6 concentration of Phosphate (mg1^{-1}) ranged between 0.2-0.08, Sulphate (mg1^{-1}) ranged between 3.60-2.00, Nitrate (mg1^{-1}) fluctuated between 0.40-0.31 and Iron ranged between 3.64-3.31 (ppm). (Table 2).

Table 2 : Monthly changes of physic-chemical parameters of Awon Reservoir.

	September 2011	October 2011	November 2011	December 2011
pH	6.0	6.2	6.6	7.2
DO (mg/1)	4.6	5.0	5.1	5.6
PO_4 (mg/1)	0.09	0.08	0.2	0.1
SO_4 (mg/1)	2.10	2.00	3.10	3.60
NO_3 (mg/1)	0.31	0.32	0.36	0.40
Fe (ppm)	3.64	3.31	3.41	3.60

VI. Discussion

Generally the species composition is in line with the community of algae known to dominate Nigeria lentic system (Akinyemi and Nwankwo, 2003). Monthly differences were observed in the occurrence of algae. The highest number of algae recorded during the wet months (Table 1) could be attributed to availability of nutrients. Generally, high diversity of algae has been

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associated to moderate nutrients level in water as well as moderate pH level (Egborge and Sagay, 1979).

The effect of nutrient on phytoplankton has been examined in many freshwater ecosystems and it was found that nutrient regulates the seasonal distribution of phytoplankton (Akinyemi 2000). Also fluctuations in the amount of phytoplankton may be attributed to the activities of predators that feed directly on phytoplankton. Also species such as *Closterium archerianum, C. dianae Navicula meniseculus, Gyrosigma scalproides, Pinnularia otiensis and Tabellaria fenestrata* were better represented, compared to species of algae like *Anabaena spiroides* and *Euglena convoluta*(Table 1).

The difference in the species composition in this study may be due to differences in physic-chemical factors such as pH, dissolved oxygen, nitrate, phosphate and sulphate concentration. pH range was neutral to slightly alkaline during the study period. Generally, nitrate and phosphate levels were very low (Egborge and Sagay, 1979).

VII. Conclusion

Research findings show that Awon reservoir consisted of algae species and moderate amount of nutrients that compared favourably with other fresh water bodies. The values of nutrients in the reservoir are within the WHO standards, an indication that the water is fit for drinking and other human activities.In addition, the presence of different species of algae like *Closterium, Navicula, Tabellaria*suggest that the water body is healthy. However, this monitoring should be carried out periodically so as to find out the prevailing conditions in the water bodies.

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