

PHYSICOCHEMICAL CHARACTERISTICS OF WATER IN SOME EARTHEN AND CONCRETE FISH PONDS IN KADUNA NORTH

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ABSTRACT

A study was carried out to investigate the physicochemical characteristics of water in some earthen and concrete ponds in Kaduna North. Fifty (50) water samples were collected from 33 concrete and 17 earthen ponds. Temperature, Nitrate, Total dissolved solids, P^H and Turbidity were determined. Results indicated that, means of temperature and pH of both concrete and earthen ponds were not significant. The mean temperature and pH were 22.4°C Vs 5.9 for earthen ponds and 24.1°C Vs 6.1 for concrete pond, respectively. The mean total dissolve solids and Nitrate concentration were at significant for both earthen and concrete ponds. A nitrate level of 0.03754 mg/L was recorded for concrete while for earthen pond is 0.0511 mg/L. It was concluded that, the physicochemical parameters determined are within optimum range for healthy productivity of the fish. However, Temperature, total dissolved solids and nitrate concentrations should be constantly monitored in both earthen and concrete ponds for better productivity in Kaduna North.

Key words: Chemical, Concrete, Fish, Pond, Water

INTRODUCTION

Water quality generally means the component of water which must be present for optimum growth of aquatic organisms. Good growth in water body is determined by temperature, nitrate concentration e.t.c conversely, other parameters like biological oxygen demand, and chemical oxygen demand which indicate pollution level of a given water body. In most water bodies, various chemical parameters occur in low concentrations. This concentration level increase due to human activities and lack of environmental regulation (Mehedi, *et al.*, 1999). Water is very precious for every living organisms on the earth. In today's scenario, unplanned Urbanization, rapid industrialization and indiscriminate use of artificial chemical cause of heavy and varied population in aquatic environments leading to determination of water quality and detection of aquatic fauna including fish. (Rasayan, 2010). Temperature, turbidity, dissolved oxygen, p^H, chloride, nitrate concentration, and total alkalinity are significant parameters used to study the water quality with references to physiochemical characteristics of the water in a cultured fish pond. (Rasayan, 2010).

Water quality is frequently a prominent concern where aquaculture is practiced. Maintaining a healthy environment is not only important to the organisms being cultured, but to the flora and fauna that are indigenous around the site (Schubart *et al.*, 2008). The secret of success in any fish farming operation depends to a large extend, on the ability of the fish farmer to closely manage the pond water by monitoring its physical, chemical and biological properties. Fish farming is gradually expanding in Kaduna State and has become an important economic activity. To date there are very few studies that evaluated the physicochemical properties of fish ponds within Kaduna North. *Therefore, we find it necessary to carry out this research, in order to provide information on the physicochemical properties of ponds in Kaduna North to determine if there is any buildup of toxic substance which could lead to bio-accumulation and magnification leading to health implications.*

MATERIALS AND METHOD

The study was conducted at the Kaduna North, located on latitude 10⁰, 31', 23" North and longitude 7⁰, 26', 25" East (GPS, 2018). Fifty (50) water samples were collected from some thirty three (33) concrete and seventeen (17) earthen ponds. Parameters such as Temperature (°C), pH, Total Dissolved Solids (mg/L) and Nitrates concentration (mg/L) were determined according to USEPA, (2009) standard guidelines. Data collected were subjected to analysis using Students T-Test, Procedures of Statistical Analysis System (SAS) version 9 (SAS, 2003). pH was determined using pH meter (Hanna Replacement pH electrode HI 98128). Dissolved oxygen and water temperature were measured at 25 cm below the surface of the water using a digital meter (VWR 2000) and total

dissolve solids was measured using an electronic pen. Water temperature, dissolved oxygen and pH in the ponds were monitored daily (Morning and Afternoon). Data collected were subjected to analysis using Students T-Test, Procedures of Statistical Analysis System (SAS) version 9 (SAS, 2003).

RESULTS AND DISCUSSION

The student's t-test results for physicochemical properties of water from earthen and concrete fish ponds in Kaduna North is presented in Table 1. The mean temperature from the earthen ponds was 22.4°C and the concrete pond was 24.1°C with no significant difference in their mean. The mean water temperature observed in this study was below the acceptable range of 28–32 °C favorable for tropical fishes such as African catfish (Finogold, 2009). The low temperature observed in this study was attributed to the cool climate at the period of the study. Generally, low temperature of ponds has a negative effect on the productivity of catfish. The P^H obtained from this study was 5.9-6.1 which agrees with the report of Stone and Thromford (2003) for good pond productivity and health fish can be maintained. Total dissolved solid varied from 35.13 – 64.17 mg/L. This may have been responsible for the variation from location to location of the ponds. Farmers use feeds to supplement pond nutrient among other the feed have been reported to increase total dissolved solids (Ogbeibu and Victor, 1989). However, the nitrate level of 0.03754 mg/L was recorded for concrete while for earthen pond is 0.0511 mg/L. The desirable limit is 0.2 mg/L and acceptable limit is less than 4 mg/L (SWQCDM, 2016). The lower values of both desirable and acceptable limits might be due to the presence of pollutants like bacteria which can remedied by water change.

Table 1: Students t-test results for physicochemical properties of water from some earthen and concrete fish ponds in Kaduna North.

Parameters	Earthen pond	Concrete Pond
Sample Size	17	33
Temperature		
Mean	22.4	24.15
SD	2.57	1.75
P-value		0.6805
p ^H		
Mean	6.147	5.966
SD	22.20	0.7709
P-value		0.4559
TDS		
Mean	64.17	35.13
SD	2220	26.26
P-value		0.0002**
Nitrate		
Mean	0.0511	0.03754
SD	0.02946	0.01870
P-value		0.0096**
P<0.01		

CONCLUSION

The physicochemical parameters determined are within optimum range for healthy productivity of the fish. However, Temperature, total dissolved solids and nitrate concentrations should be constantly monitored in both earthen and concrete ponds for better productivity in Kaduna North.

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