International Journal of Educational Research and Management Technology
ISSN: 2545-5893 (Print) 2545-5877 (Online)
Volume 3, Number 1, March 2018
http://www.casirmediapublishing.com

Assessment of the Run-off Water into Umudike Fish Pond for Aquaculture Production

Nwakanma, C., and Uzoanya R. C
Department of Environmental Management and Toxicology
College of Natural Resources and Environmental Management
Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
Email: dr.nwakanmac@gmail.com

ABSTRACT

Pollution of river, ponds, seas, lake and most underground water has being a global problem. In this study, assessment of run-off water into Umudike Fish Pond for Aquaculture Production was investigated to ascertain the presence quality for fish rearing. The pH, EC, TDS and temperature, zinc, lead, cadmium and iron were determined. Mean values obtained from the study shows DO (5.55±0.04); Temperature (27.7±0.07); Turbidity (30.6±0.14); Total Hardness (57.8 ±0.07); Total Suspended Solids (11.8±0.05); Zn (1.3±0.04); Pb (Neligible); Cd (0.31 ± 0.04);Fe (0.5±0.05); pH(6.2±0.02); EC (32.6 ± 0.06); Alkalinity (42.5± 3.5); Nitrate (22.6 ± 0.4) and Phosphate (2.78 ± 0.05). The results obtained when compared with standards for pond water quality were within recommended ranged. Although, it is important that regular monitoring of storm water or run-off water into the fish pond be checked since the fish farm is used for the production of fish for commercial purposes.

Keywords: *Water quality, Umudike, Fish farm, Pollution, Abia State, Storm water*

INTRODUCTION

River pollution has several dimensions and effective monitoring and control of river pollution require the expertise from various disciplines. Pollution of river, ponds, seas, lake and most underground water has being a global problem. These physico-chemical characteristics in many ways have significant influence and impact on aquatic life (Nwakanma and Ubah, 2015). Any alternation in these parameters may disturb the quality of water. Dissolved Oxygen is of great important to all the living organisms and is considered to be the sole parameter which to a large extent can reveal the native of whole water body. Euthrophic water bodies have a wide range of dissolved oxygen and as such oligotrophic water bodies have narrow range of dissolved oxygen (Uba 2000) for more organic matter, more oxygen is required by bacteria for its decomposition. This results in release of organic nutrients in water bodies resulting in death of organism thriving on water (Okpokwasili and Olisa, 1991). The magnitude of BOD is related to the amount of organic material in waste water. The strength of waste water is expressed in terms of BOD level. The physiological parameter of effluents on Aba River located in Abia State, Nigeria had been reported by (Nwakanma and Okechukwu, 2016). Water contaminated by effluent from various sources is associated with heavy diseases burden (Yamamoto,1980; Moffat and Linden, 1995) and this could influence the current shorter life expectancy in the developing countries compare with developed nation (WHO, 2004). Good water quality majorly from run-offs has become a scare commodity due to over exploitation and pollution (Patil *et al*., 2012). Pollution is caused when a change in the physical, chemical or biological condition in the environment harmfully affect quality of human life directly or indirectly by consuming bio-accumulated pollutants stored in most fishes from fish pond (Nogueira *et al*., 2003; Goel, 2006). Agriculture, Industrial, Sewage and Municipal wastes are been continuosly added to water run-offs hence affect the biological and physiochemical qualities of water making them unfit for use in most fish ponds and other organisms (Gupta *et al*., 2005). Nigeria ranks third on the list of countries with inadequate water supply and sanitation coverage globally (Gerardi, 2005). The main purpose of the study was to identify the physio-chemical and bacteriological parameters of water quality from runoffs into Umudike fish pond.

MATERIALS AND METHODS

Water samples used in this experiment was typical runoff water into Umudike fish pond, collected at about 7:30am to 8am in the morning using a sample bottle. The sample was taken immediately to laboratory for physical and chemical parameters determination (APHA, 2005). The pH, EC, TDS and temperature were determined by the use of Hanna instrument NI 911300. The following heavy metals were determined zinc, lead, cadmium and iron. They were determined by the use of Atomic absorption spectrometer spectrophotometer (AAS). The heavy metals were read off in the spectrometer using their respective wavelength readings. Phosphate content in the given water sample was determined as inorganic phosphate by calorimetric method. In this method, 50ml of the filtrate clear sample was taken in a conical flask. 20ml of ammonium molybdate was added to it. 5 drops of $SnCl_2$ solution was added to it. The solution becomes blue and the reading was taken at 690nm on the spectrometer within 10-12 minutes. Same procedure was repeated for the standard solution of different concentration for distilled water. The concentration was determined with the help of standard curve obtained by plotting standard values against absorbance. Nitrate content in the water sample was determined by phenol disulphonic acid method. In this method, 50cl of filtrate sample was taken in a porcelain basin and was evaporated to dryness. It was cooled and residue was dissolved in 2 ml of phenol disulphonic acid and was diluted to 50ml. 6ml of liquor ammonia was added to develop yellow color. Then the reading was taken at 410nm on spectrophotometer. Same procedure was repeated and for the standard solution of different concentration and for distilled water. Then the concentration of nitrate was determined from the standard curve obtained by plotting standard value against absorbance. Total alkalinity is the measure of the capacity of the water to neutralize a strong acid. The alkalinity in water is generally imparted by salt of carbonate, phosphate, nitrates, borates, silicates etc. together with hydroxyl ions in Free State. Total alkalinity of water was determined by titrimetric method. Dissolved oxygen was determined by the use of EXTECH Instruments SDL 150. The meter is a crystal multi meter with a probe that is dropped into the water sample and read off at the digital 2 minutes. The reading is done twice and average taken. The data obtained was analyzed statistically using SPSS package to calculate the mean, standard deviation and variance of the data. Duncan Multiple Range Test (DMRT) was used to separate the mean of the data at probability level of ($P < 0.05$).

RESULTS AND DISCUSSION

The result of the physical and biochemical parameters of the fish pond are presented in table 1. The result shows the mean values of the following parameters: DO, Temperature, TN, Turbidity and TSS.

Table 1: Mean Value of Physical And Biochemical Parameters of Runoff Umudike Fish Pond

Parameter	Mean	Standard deviation	Variance	WHO
DO	5.55	0.04	0.00	3.5
Temperature	27.7	0.07	0.01	15-35
TN	57.8	0.07	0.01	>20
Turbidity	30.6	0.14	0.02	30-80
TSS	11.8	0.06	0.00	<10

The dissolved oxygen content of the sample indicates that the mean dissolved oxygen value of the run-off water of the fish pond is 5.55±0.04. This indicates that the dissolved oxygen value falls within the WHO threshold value of dissolved oxygen in culturing fish. This finding reveals that the run-off into MOUAU fish pond is conducive for fish culturing. The temperature content of the sample indicates that the mean pH value of the runoff water of the fish pond is 27.7±0.07 this shows that the temperature value of the runoff falls within the WHO threshold value of temperature in culturing fish this finding indicates that the runoff into MOUAU fish pond is conducive for fish culturing. Turbidity availability in the sample reviews that the mean turbidity value of the runoff water in the fish farming is 30.6±0.14. The indication runoff falls within WHO standard value of turbidity in fish pond. This indicates that the runoff into MOUAU fish pond is conducive in turbidity. The total hardness content of the sample proves that the mean total hardness value of the runoff water of fish pond is 57.8 ±0.07. This indicates that total hardness value of runoff falls within the WHO threshold value of total hardness in culturing fish. The result indicates that the runoff into MOUAU fish pond is good for fish culturing. The total suspended content of the samples reviews that mean total suspended solid values of runoff water of the fish pond is 11.8±0.05. This indicates that total suspended solid value of runoff falls out within WHO threshold value of total suspended solid value in fish culturing. This pond is not conducive in total suspended solid. The result of the heavy metal parameters of the fish pond is presented in table 2. The result shows the mean values of the following parameters: Zn, Pb, Cd and Fe.

Table . 2: Mean value of heavy metals parameters of runoff available in MOUAU Fish Pond

Parameter	Mean	Standard deviation	Variance	WHO
Zinc	1.3	0.04	0.00	< 0.1
Lead	ND	ND	ND	< 0.05
Cadmium	0.31	0.04	0.00	< 0.05
Iron	0.5	0.05	0.00	0.3

The zinc content of the sample shows that the mean zinc value of the runoff water of the fish pond is 1.3±0.04. The result indicates that the zinc in water value of runoff falls out from WHO threshold value of zinc in culturing fish. The result indicates that the runoff into MOUAU fish pond is high. The lead content of the sample shows that the fish pond is not detected. Lead comes from deposition of exhaust from vehicles in the atmosphere, batteries toxicity from lead are mines, lead smelter and sewage discharge. Chronic lead toxicity in fish leads to nervous damage which can be determined by blackening of the fins (Dojlido and Best, (1993). The Cadmium content of the sample indicates that mean Cadmium value of runoff water of the fish pond is 0.31 ± 0.04. From the result shows that the Cadmium value in runoff water in higher to WHO value threshold in fish pond. This indicates that Cadmium in MOUAU fish pond is uncondusive. Cadmium is high toxic sources are plating batteries, sewage sludge and fertilizers in fish, acute toxic exposure results to damage of the central nervous system and parenchymatous organs. The iron content of the sample indicates that the mean iron value at the runoff water of the fish pond is 0.5±0.05. The aesthetic objective for iron, set by appearance effects, in water is 0.3mg/L. Excessive levels of iron in water itself, may produce a bitter colour to the water itself, it may produce a brownish astringent taste in water and also promote growth of iron bacteria. The finding indicates that iron content is high from WHO standard (WHO, 2004).

The result of the chemical parameter of the fish pond is presented in table 3, the result shows the mean value of the following parameters: pH, EC, TA, TDS, PO_4 and NO_8

Parameter	Mean	Standard deviation	Variance	WHO MPL (2006)
pH	6.2	0.02	0.00	6.5-8.5
EC	32.6	0.06	0.00	< 100
TA	42.5	3.5	12.5	30-500
TDS	18.3	0.4	0.13	500mg/L
NO_8	22.6	0.4	0.2	10.0
PO_4	2.78	0.05	0.00	< 100

The pH content of the sample shows that the mean value of the runoff water into fish pond is 6.2±0.02. The principal objective in controlling pH is to neither produce water that is neither corrosive nor produce incrustation. At pH levels above 8.5, mineral incrustation and bitter taste can occur. From the result finding, it shows that pH content in the runoff into MOUAU fish pond is conducive. The sample indicates the mean electrical conductivity of the runoff water to fish pond is 32.6 ± 0.06. When conductivity levels are high, evaluate other individual characteristics of the water. The maximum permissible limit is <100, which indicates that the electrical conductivity of runoff into MOUAU fish farm is good. The alkalinity level of the sample is 42.5± 3.5. Alkalinity which is the measure of resistance of the water to the effect of acids added to water with the limit standard of alkalinity content in the runoff into MOUAU fish farms is acceptable. The mean result of the sample indicates to be 13.3 ± 0.4. The effects of TDS on water quality depend on the level of individual components. The conduciveness of runoff water generally considered to be good. From the sample result shows that TDS level is in good condition.

The mean result of nitrate in the sample shows the level of nitrate to be 22.6 ± 0.4. The standard for nitrate is 10.0mg/L. the result indicates that nitrate is present in water is high, as a result of decay plants or animal material, use of agricultural contamination. This shows that the runoff into fish farm is not good. The mean sample result of phosphate value of the runoff water in the fish farming is 2.78 ± 0.05. This indicates that the water phosphate value of runoff falls within WHO standard. Phosphate is a limiting nutrient needed for the growth of all plants-aquatic plans and algae alike. However, excess concentration especially in ponds, rivers and lake can result to algal blooms. It is recognized that aquaculture's contribution to food security is significant, and as captured fisheries supply levels off, the demand for fishery products will be supplied by aquaculture. Special water quality criteria in aquaculture zones, especially from effluent from other sources should be in place. As mentioned earlier, the exciting standard and criteria are meant to protect the water body in general, and there are no special provisions protecting the aquaculture industry. One problem for iron compliance may be due to lack of insufficient information on the effects of pollution to the water environment as well to the laws and guidelines in place. This can be address by including information campaign as part of the water quality monitoring guideline. Monitoring the compliance and physical monitoring could be identified as the critical factors that can ensure the success or failure of the monitoring system in place. Government has resources to regularly and religiously monitor all the monitoring stations in the country, as well as conduct visit to all the point sources of runoff waste or effluent.

REFERENCES

American Public Health Association (2005). Standard methods for examination of water and waste water. 20 edition.

Dojlido, J. and G. A. Best (1993). Chemistry of water and water pollution. Wweat Sussex: Ellis Horwood Limited.

Gerardi, M. A. (2005). Waste water Pathogen's. Waste Water Microbiology Series. p147.

Gupta, D.P., Sunita, J.P., and Saharan, I. (2009). Physiochemical Analysis of Ground Water of Selected Area of Kaithal City (Haryana) India, Researcher, 1(2), p 1-5.

Goel, P.K. (2006). Water pollution Causes, Effects and Control; New Age International. p179.

Hopkinson, C.S. (1985). Shallow-Water and Pelagic Metabolism: Evidence of Heterotrophy in the near-shore Georgia Bight, Marine Biology, 87. p 19.

Moffat, D. and Linden, O. (1995). Perception and reality: Assessing priorities for sustainable Development in the Niger River Delta. Royal Swedish Academy of Science 24: 7 - 8.

Nogueira, G., Nakamura, V.C. Tognim, C.B.M., Filho, A.A.B., and Filho, P.D.B (2003). Microbiological Quality of Drinking Water of Urban and Rural Communities, Brazil. Rev. Saude Publica. 37(2):232-236.

Nwakanma, C., and Ubah, G. E. (2015). The Study of Physicochemical and Microbial parameter of Ugwumuo river. *International Journal of Current Advanced Research (IJCAR), Vol 4, Issue 10, pp. 454 – 460, October 2015.*

Nwakanma, C., and Okechukwu, C. U.(2016). The physiological parameter of effluents on Aba river located in Abia State, Nigeria. . *European Journal of Biomedical and Pharmaceutical Science (EJBPS) Vol. 3, Issue 1, PP 5 – 10, 2016.*

Okpokwasili, G.C and Olisa, A.O.(1991). River water biodegradation of surfactants in liquid detergents and shampoos. *Water Research 25* :1425-1429.

Patil, P.N., Sawant, D.V., and Deshmukh R.N. (2012*). International Journal of Environmental Sciences.* 3(3).

Uba, E. C. (2000). Numerical simulation study of groundwater contaminant and transport at a potentially polluted are a in the Niger Delta. Proceedings of the 24th SPE Nigeria Annual Technological Conference and Exhibition. Abuja, Nigeria

WHO.(2004). Guidelines for Drinking water Quality: (iii) Health, Criteria and Supporting Information, World Health Organization. Geneva.

Yamamoto, C. J. (1980). Behavioural approaches in aquatic toxicity investigations. A review in toxic substances in the aquatic environment. An international aspect. American Fisheries Society, Water Quality Section Bethesada, MD. p.72 -98.