IOSR Journal of Biotechnology and Biochemistry (IOSR-JBB)
ISSN: 2455-264X, Volume 1, Issue 3 (Mar. – Apr. 2015), PP 01-03
www.iosrjournals.org

Toxicological Effect of Effluents from Indomie Plc on Some Biochemical Parameters of Fish in New Calabar River

Samuel Chimezie Onuoha* and Mercy Onuekwuzu Ifeanacho
Department of Biochemistry, University of PortHarcourt, PMB 5323 Choba, Nigeria

Abstract: *The effect of effluent from indomie food company in Choba, PortHacourt in Niger Delta part of Nigeria on the biochemical parameters of Talapia fish from New Calabar river was studied. To achieved this, parameters like potassium ion (K^+) concentration, chloride ion (CL^-) concentration, sodium ion (Na^+) concentration, urea concentration and creatinine concentration in the blood, gills, liver and muscles of the fish were measured. The entire river was divided into four(4) stations during the collection of fish samples. Station 1: the non point source which serves as control. Station 2: the point source where indomie waste is discharged into the water; station 3: 10m upstream from the source; station 4: 10m downstream from the source. The results of the analysis show that: in the blood, K^+ level in fish from the point source was higher than those from other stations and this increase is statistically significant. Cl^- did not differ significantly between station 1 and 3, station 2 and 4. Urea level was significantly high at station 2 compared to station 1,3, and 4. Na^+ showed a significant difference at station 4 and 2 compared to station 1and 3. At the gill, a similar trend was observed for K^+, urea ,creatinine, Na^+ while Cl^-has no significant change ($p<0.05$). Urea was significantly high at station 4 and 2 as compared to station 1and 3. At the liver, no significant change was seen in Cl^- for all the stations. Urea was significantly high in station 2 when compared to the values from the other stations. At the muscle, K^+ level was slightly higher at station 2. Cl^- level was significantly higher at station 4. Urea level was higher at station 4. Na^+ level was significantly higher in station 2. This research revealed an adverse effect of the indomie effluent on the Tilapia fish in New Calabar river.*

Key words: *Effluent, Aquatic, Waste water, Fishes*

I. Introduction

The existence of man is largely dependent on the state of the environment as he depends directly and indirectly on it for the basic necessities of life. The concern over water quality relates not just to the water itself, but also to the danger of diffusion of toxic substances into other ecosystem (Pretorius, 2000; Bezuidenhout et al., 2002). The aquatic environment can be affected by bioaccumulation of harmful substances in the water (Alam et al., 2006).Marine and estuarine environments are the natural habitat for great diversities of fishes, worms (annelids), marine plants of all sizes and different classes of species of micro-organisms. These species of organisms (flora and fauna) interrelate with each other and also with their immediate environment (water and mud) as well as the atmosphere for a balanced energy exchange (Ommanney, 1969; Eltrigham, 1971; GESAMP 1995). Water quality plays a vital role in the distribution, abundance and diversity of aquatic organisms. Fish has been used as a bio-indicator of water quality by many researchers (Ogbeibu and Victor, 1989; Oguzie, 2003; Yamazaki et al.,1996; Idodo-Umeh, 2002). The justification lies on the fact that whereas water quality of river samples indicates short-term conditions, fish conditions also respond to episodic events and therefore integrate environmental conditions over time. Victor and Tetteh (1988) and Oguzie (2003) reported a reduction in fish diversity associated with the introduction of municipal waste and industrial effluents.

II. Materials And Methods

Study Area:

The new Calabar River is located in the tropical Rain forest of the lower Niger Delta and has a gradual transition from fresh to salt water. The River is about 98km long, 40km of which is fresh while the rest is brackish water. It empties into the Atlantic Ocean, for about 87km of its length, the river is Tidal black water. The study area is tidal fresh water.

The area is an intertidal wetland within the lower part of the BUGUMA river system adjoining a densely populated municipal environment. The area lies between longitude $7^0.00$ to $7^0.15$ within the area the river receives effluents from anthropogenic activities such as the communities drainage system.

Station 1: This is the non-point source and it serves as a control.
Station 2: This is the point source where indomie wastes is discharged into the water.
Station 3: This is 10m upstream from the source
Station 4: This is 10m down-stream from the source.
The water flows from station 3-2 and 4-1.

Collection of Samples

A dugout canoe with paddles was used for sampling at the various stations. Fish samples were also collected from each of the sampling station. Nets of 60m large and stow nets of 5.0m wide were used along the course of the river as well as small species of fish were sampled. The fishing effort was the same in each station sampled. All fishes were taken to the laboratory for immediate preservation with 10% formulation solution in labeled plastic containers. In the laboratory, the organs of the fish (the muscles, the gills, the liver and the blood) were biochemically analyzed. The biochemical test carried out on the fishes were urea, creatinine and electrolytes(chloride, sodium and potassium) which are osmoregulatory markers of a fish and the water.

Electrolytes(k^+, Na^+, Cl^-), urea, creatinine were determined using standard ready-to-use kits(Randox Ltd, UK) following the manufacturers instructions.

Statistical analysis: All analysis were carried out in triplicates. Data was subjected to analysis of variance (ANOVA) and means were separated using Duncans Multiple Range Test at $p \leq 0.05$(Gomez and Gomez 1985; Steel and Torrie, 1980)

III. Results

Table 1: Potassium, Chlorine, Urea ,Creatinine and Sodium level in blood of Tilapia fish from new Calabar River(mmol/l)

Station	Potassium x±SEM	Chlorine x±SEM	Urea x±SEM	Creatinine x±SEM	Sodium x±SEM
1	2.20±0.15[a]	43.00±1.15[ac]	5.40±0.10[a]	4.00±0.29[b]	18.00±0.50[ab]
2	4.50±0.29[b]	34.00±0.58[bd]	8.90±0.31[bd]	9.90±0.26	34.00±0.58[bc]
3	2.10±0.15[a]	43.00±1.15[ac]	5.20±0.06[a]	6.00±0.25[cd]	20.00±0.58[ab]
4	3.80±0.25	34.00±0.58[bd]	6.50±0.25[b]	5.00±0.06[b]	41.00±1.58[ac]

Table 2: Potassium, Chlorine, Urea ,Creatinine and Sodium level in the gills of Tilapia fish from new Calabar River(mmol/l)

Station	Potassium x±SEM	Chlorine x±SEM	Urea x±SEM	Creatinine x±SEM	Sodium x±SEM
1	1.30±0.06[a]	2.00±0.06	1.60±0.10[ab]	0.90±0.06	10.00±4.04[abc]
2	2.60±0.21[b]	2.00±0.12	4.10±0.10[bc]	2.60±0.21	62.50±5.25[bcd]
3	1.60±0.21	2.60±0.21	2.50±0.15[ac]	3.00±0.06	9.00±0.25[acd]
4	2.10±0.15[c]	2.00±0.12	4.80±0.36[bc]	3.10±0.15	32.00±1.00[bd]

Table 3: Potassium, Chlorine,Urea, Creatinine and Sodium levels in the liver of Tilapia fish from new Calabar River (mmol/l)

Station	Potassium x±SEM	Chlorine x±SEM	Urea x±SEM	Creatinine x±SEM	Sodium x±SEM
1	1.10±0.15[a]	2.00±0.12	8.90±0.15[ab]	1.40±0.10	38.00±1.53[abc]
2	3.30±1.06[b]	2.00±0.12	11.70±0.21[bc]	1 0.20±0.02	78.00±2.08[bcd]
3	1.30±0.06	2.00±0.12	3.40±0.31[ac]	2.30±0.15	35.00±1.00[abc]
4	2.20±0.50[c]	2.00±0.12	3.40±0.31[ac]	1.90±0.21	57.00±1.53[abd]

Table 4: Potassium, Chlorine, Urea, Creatinine, Sodium levels in the Muscle of Tilapia fish from new Calabar River(mmol/l)

Station	Potassium x±SEM	Chlorine x±SEM	Urea x±SEM	Creatinine x±SEM	Sodium x±SEM
1	8.90±0.15[a]	2.00±0.12	14.40±0.31	10.70±0.14[ab]	32.00±1.53[ab]
2	10.40±0.45[b]	2.00±0.12	17.10±0.49	11.17±0.20[cd]	64.00±0.58[cd]
3	5.10±0.49[c]	4.10±0.10	15.10±0.40	0.28±0.15[bc]	39.00±1.52[ab]
4	8.50±0.25	8.30±0.35	23.00±0.15[abd]	16.40±0.31[ac]	57.00±2.52[bc]

Station 1: This is the non-point source and it serves as a control from the source point. The water flows from station 3-2 and 1-4

Station 2: Contaminated water from indomie source outlet. This is the point source where indomie wastes is discharged into the water body.

Station 3: Contaminated water 10m upstream from the source.

Station 4: Contamined water 10m down-stream from the source.

Data represents mean±standard error of mean of triplicate samples.Values with the same superscript letters in the same column(in Tables 1-4) are not statistically significant at 95% confidence level.

IV. Discussion

The water quality of aquatic habitats is considered the main factor controlling the state of health and disease in both wild and cultured fish. There is a high level of deterioration of natural water due to industrial activities. Effluents from industries that are discharged in natural water affects the quality and quantity of the fish.(Zaghloul et al., 2005 and Salah El-Deen et al., 1999). Table 1 shows that there is an increase in the level of the electrolytes- potassium, sodium and the metabolites urea and creatinine in the blood of fish found at the point source. The point source is the point were the wastes are directly discharged in the water. Tis suggests a higher level of pollution when compared to the values obtained from fish some distances away from the point source and from the control point.

A similar trend was observed with respect to the liver and muscle with a slight deviation on chloride ion. This high value is second by those values obtained 10m from the source. This is similar to the result obtained by Khalid(2007). This suggest that the further ones goes away from the point of discharge of effluents the more dilute the toxins becomes. This is shown by the drop in the values obtained.

Thes serious effects could affect fish quality and hence become a threat to man who consumes this aquatic organism.

References

[1]. Alam, M.N., Elahi, F., Didar Ul-ALam, Md (2006). Risk and Water Quality Assessment Overview of River Sitalakhya in Bangladesh. Academic open journal. 19, 10.
[2]. Bezuidenhout, C.C., Mthembu, N., Puckree, T., and Lin, J. (2002). Microbiological evaluation of the Mhlathuze River, Kwazulu-Natal (RSA). Water SA 28: 28-286.
[3]. Eltringham, S.K (1971). Life in mud and sand. The English University press Ltd. Unibooked.
[4]. GESAMP (IMO/FAO/UNESCO 10C/WMO/1ACA/UN/UNEP). (1995)Joint groups of experts the scientific aspects of marine environmental protection. The sea surface micro layer and its role in global change- Rep- slid. GESAMP. 59-96.
[5]. Gomez, A.K., Gomez, A.A.(1984): statistical procedure for Agricultural Research.2nd edition, Wiley, New York, USA.
[6]. Idodo-Umeh, G. (2002). Pollution assessment of Olomoro water bodies using physical, chemical and biological indices; Ph.D Thesis, University of Benin, Benin City, Nigeria. 485.
[7]. Khalid, H. Zaghloul, Wafaa .S. Hasheesh, Iman. A. Zahran and Mohamed-Assem .S. Marie(2007): Egypt J. Aquat. Biol. And fish 11(3): 57-88
[8]. Ogbeibu, A.E. and Victor, R. (1989). The effects of road and bridge construction on the bank-root macrobenthic invertebrates of a Southern Nigeria stream. Environmental pollution, 56: 85-100.
[9]. Oguzie, F.A. (2003). Heavy metals in fish water and effluents of the lower Ikpoba river in Benin city, Nigeria. Pak. J. sci. ind. Res., 46(3):156-160.
[10]. Ommanney, F.D. (1969). The Inheritors of an Ancient world in : The fishes (ed) Time-life books. 9-161.
[11]. Pretorious, L (2000). An Investigation into the effect of various levels of sanitation on surface water quality in a typical developing community.Water S.A. 26(23): 10-12.
[12]. Salah El-Deen, M.A; Zaghloul, K.H; El- Naggar, G.O. and Abo-Hegab, S.(1999): Concentrations of heavy metals in water sediment and fish in the River Nile in the Industrial area of Helwan Egypt. J. Zool, 32:373-395.
[13]. Steel, R.G.D., Torrie, J.H. (1980) Principles and procedures of statistics, 2nd edition, McGraw-Hill, New York, USA.
[14]. Victor, R., and Tettah, J.O. (1988). Fish communities of a perturbed stream in Southern Nigeria. Journal of Tropical Ecology. 4:49-59.
[15]. Yamazaki, M., Tanizaki, Y., Shinikawa, T. (1996). Silver and other trace elements in freshwater fish carasius auratus langsodorifill from Asakawa River in Tokyo, Japan. Environmental pollution. 94(1):83-90.
[16]. Zaghloul,K.H; Omar,W.A and Abo-Hegeb, S.(2005): Environmental hazard risk assessment on oreochromis niloticus and Tilapia Zilli fish. J. Egypt Ger. Sco. Zool. 46(A): 105-139