Available online at www.asric.org

ASRIC Journal on Agricultural Sciences 1 (2020) 1-10

Heavy Metals and Physico-Chemical Properties of *Clarias Gariepinus* from Five Water Bodies in South East Nigeria

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Received 19 December 2019; revised 30 April 2020; accepted 30 November 2020

Abstract

This study was conducted to evaluate the concentration of lead (Pb), copper (Cu) and zinc (Zn) of *clarias gariepinus* from three rivers (Uwana, Oziza, Akpoha,) and two aquaculture fish farms (PolyUwana and Ngwo) in the south-eastern part of Nigeria. Samples of fish species and water were obtained in triplicates from fishermen and aquaculture sellers. The fish samples were digested and analyzed. The physico-chemical properties of the water samples were also determined. The result showed that Pb concentrations (ppm) in the fish samples were 0.000 ± 0.001 (Uwana river), 0.014 ± 0.041 (Ngwo), 0.022 ± 0.026 (Akpoha river), 0.043 ± 0.057 (Oziza river) and 0.047 ± 0.063 (PolyUwana). Cu concentrations were 0.020 ± 0.027 (Uwana river), 0.028 ± 0.026 (Oziza river), 0.029 ± 0.023 (PolyUwana), 0.038 ± 0.021 (Ngwo) and 0.048 ± 0.071 (Akpoha river). Zn concentrations were 0.366 ± 0.178 (Uwana river), 0.458 ± 0.323 (PolyUwana), 0.467 ± 0.356 (Akpoha river), 0.486 ± 0.245 (Oziza river) and 0.492 ± 0.161 (Ngwo). There were significant ($p < 0.05$) differences between the river sources for Pb. There was no significant difference between the river sources for Zn and Cu. The physicochemical properties of the water showed low levels of the elements studied and the highest concentration of metals was in Oziza river while the lowest concentration was in Ngwo Aquaculture. There were no significant ($p > 0.05$) differences in Pb, Cu and Zn concentrations of the water samples. Water sample from Oziza river was also found to have the highest turbidity (15.20), highest titrable acidity (0.95) and lowest pH (5.47). In all cases, the heavy metal concentrations were lower than the maximum limit set by FAO/WHO.

Keywords: Heavy metals; *clarias gariepinus*; Physico-chemical, Aquaculture

1. Introduction

Pollution of the aquatic environment by inorganic chemicals has been considered a major threat to the aquatic organisms including fishes. The agricultural drainage water containing pesticides and fertilizers and effluents of industrial activities and run offs in addition to sewage effluents, supply to water bodies huge quantities of inorganic anions and heavy metals (ECDG, 2002). The sources of water can beconstantly polluted with a series of metals (as well as with other pollutant) which can be sources of intoxication for man, depending on the dose of metals that exists in the water.

Heavy metals are generally referred to as those metals which possess a specific density of more than 5 g/cm^3 and adversely affect the environment and living organisms (Jarup, 2003). These metals are essential for the maintenance of various biochemical and physiological functions in living

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Papanikolaou, N. C., Hatzidaki, E. G., Belivanis, S., Tzanakakis, G. and Tsatsakis, A. M. (2005). Lead toxicity update. A brief review. *Med Sci Monitor*. 11(10):RA329.

Parmar, M. and Thakur, L. S. (2013). Heavy Metal Cu, Ni And Zn: Toxicity, Health Hazards And Their Removal Techniques By Low Cost Adsorbents: A Short Overview, 3(3):143-157.

Raut ,N., Charif, G., Al-Saadi, A., Al-Aisri, A. and Al-Ajmi, A. (2012). A Critical Review of Removal of Zinc from Wastewater, *Proceedings of the World Congress on Engineering* Vol I WCE 2012, July 4 - 6, 2012, London, U.K.

Samir, M. S. and Ibrahim, M. S. (2008). Assessment of heavy metals pollution in water and sediments and their effect on Oreocheromis Niloticus in the Northern Delta Lakes, Egypt. *8th International symposium on Tilapia in Aquaculture*, 475-489.

Santos, I. R., E. V. Silva-filho., C. E Schaefer., M. R. Alhuguergue – Filho and L. S. Campos. (2005). Heavy metals contamination in coastal sediments and soils near the Brazilian Antartic station, king George Island. *Marine Pollution Bulletin*. 50: 85-194.

Shakweer, L. M. and M. M. Abbas (1996). Effect of sex on the concentration levels of some trace metals in Oreochromis niloticus of lake edku and sardinella aurita of the mediteranean waters, Egypt. *Bulltin of the Institute Oceanography and Fisheries* 22: 121-141.

Shyamala, R., Shanthi, M. and Lalitha, P. (2008). Physiochemical analysis of borewell water samples of Telugupalayan area in Coimbatore district, Tamilnadu, India, *E-Journal of Chemistry*, 5(4): 924-929.

Skelton, P. (1993). A Complete Guide to the Freshwater Fishes of Southern Africa. Halfway House: Southern Book Publishers Ltd.124p.

Taylor, M. P., Winder, C. and Lanphear, B. P. (2012). Eliminating childhood lead toxicity in Australia: a call to lower the intervention level. *MJA*. 197(9):493.

Teo, J., Goh, K., Ahuja, A., Ng, H. and Poon, W. (1997). Intracranial vascular calcifications, glioblastoma multiforme, and lead poisoning. *AJNR*. 18:576–579.

Teugels, G. G. (1986). A systematic revision of the African specie of the genus Clarias (Pisces: Clariidae). *Annales musee Royal de l'Afrique Centrale*, 247: 1- 199.

Ting-Chu, H. (2009). Experimental assessment of adsorption of Cu2+ and Ni2+ from aqueous solution by oyster shell powder. *Elsevier Journal of Hazardous Materials* 171,pp 995–1000, Journal homepage. www.elsevier.com/locate/jhazmat

Tsironi, T. and Taoukis, P. S. (2017). Effect of storage temperature and osmotic pre-treatment with alternative solutes on the shelf-life of gilthead seabream (Sparus aurata) fillets. *Aquaculture and Fisheries*, 2(1):39-47. http://dx.doi. org/10.1016/j.aaf.2016.10.003.

Voet, D. and Voet, J. G. (2004). Biochemistry. 3rd Edition, John Wiley and Sons Inc., U.S.A.

Wasiu, A. O., Olukayode, A. M and Ofelia, G. O. (2017). Comparison of proximate composition and sensory attributes of Clariid catfish species of Clarias gariepinus, Heterobranchus bidorsalis, and their hybrids *Food Science & Nutrition*. 5(2): 285–291

World Health Organization (WHO) (2004). Guidelines for Drinking Water Quality. 3rd Ed., World Health Organization, ISBN: 92-4-154638-7, p. 516.