

***Lumbriculidea*: A Bio-Indicator of Pollution of Some Ponds in Kano Metropolitan City, Nigeria**

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ABSTRACT

The research was a two years study of worms accidentally encountered during sampling of water from ponds distributed throughout Kano metropolis. Eight heavy metals; zinc, lead, nickel, cobalt, iron, manganese, copper and chromium were found to be significantly present in the samples of *Lumbriculidae* investigated during both seasons. Two hypotheses were rejected. The result of dry season ranged between 0.62 ± 0.03 (Fe) and 0.22 ± 0.03 (Cu) while during rainy season the result ranged between 0.57 ± 0.02 (Fe) and 0.17 ± 0.05 (Cu). The samples of *Lumbriculidae* from Kududufin Farfajiya and Kududufin Rariya were implicated to be most polluted. Therefore this study may serve as an important warning signal to stakeholders and Government for necessary measure at the appropriate time.

Keywords: Heavy metals, *Lumbriculidae*, ponds and pollution.

INTRODUCTION

The term heavy metals have been used for about two decades in a number of publications and in legislations involving use of hazardous chemicals (Life Extension, 2006). It is often used as a general term for metals and semimetals (metalloids) that are associated with contamination and potential toxicity or ecotoxicity (Duffus, 2002). Various definitions relating having metal to atomic weight irrespective of atomic mass or atomic number has been reported Phipps (1981); Variloon and Duffus (2000); Nieboer and Richardson (1980). Similarly, Parker (1989); Lozet and Mathieu (1991); Morris (1992) gave different figures in g/cm^3 as definition of heavy metals. Generally, authors have divergent views as regards to a common definition as a consensus definition for the terminology.



Fig 1: Lumbriculidae from [Kaygorodova, & Liventseva, 2007]

Accumulations of heavy metals by marine invertebrates have continued to receive great concern probably because of the inter-relationship with respect to their food chain that exists between the Flora and Fauna. It has been reported that marine invertebrates often bioaccumulate heavy metals much higher than the water they lived (Alloways and Ayres, 1997; Jamieson, 1988; Kaygorodova, & Liventseva, 2007). The amount of trace metals accumulated largely depends on the species as organisms like lumbriculidae anodata grandis grandis, elminius modestus (barnacles), prawn, oyster absorbs concentration of trace into their bodies differently (Rainbow and White, 1989). It might be of much interest that some organism lie like echnogammarus, pirlotic and palaemon elegans absorbs essential metals; Cu and Zn with regulation however non essential metals; Cd are accumulated without regulation (Alloways and Ayres, 1997). Mussel and lumbriculidae generally have been implicated as very good accumulation of trace metals in aquatic ecosystem (Jamieson, 1988; Kaygorodova, and Liventseva, 2007;

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Laucenstein, Robertson and O' Connor, 1990). This study is aimed at estimating levels of heavy metals in the samples of lumbricolidae with a view to serve as possible indicator of water pollution in the ponds studied.

Design of Hypothesis

HO₁: There is no significant difference in the concentrations of heavy metals in the samples of lumbricolidae during dry season in Kano.

HO₂: There is no significant difference in the concentrations of heavy metals in the samples of lumbricolidae during rainy seasons in Kano.

METHODOLOGY

Trioxonitrate (V) acid (HNO₃) (VII) acid HClO₄. 2H₂O Worm Digestion

The worms were brought into laboratory for identification by the specialist then dried at 120°C to a constant weight in an oven. 0.5 g of the sample was weighed on a watch glass and transferred into a conical flask and digested in 80 cm³ HNO₃ and 4 cm³ HClO₄ using hot plate carefully and gradually until the entire sample dissolved. The sample was filtered into 100 cm³

volumetric flask and the solution was made up to the mark with distilled water and portions of these solutions were taken for the required metal determination and Samples were analysed with Alpha 4 Flame Atomic Spectrophotometer as described (Canli *et al.*, 1998).

RESULTS DISCUSSION

The analysis of the result shows variations with highly significant mean levels during dry and rainy seasons. The result of dry season ranged between 0.62 ± 0.03 (Fe) and 0.22 ± 0.03 (Cu) while during rainy season the result ranged between 0.57 ± 0.02 (Fe) and 0.17 ± 0.05 (Cu). The general difference between the dry and rainy season result could be ascribed to the fact that the rainy season result was lower than that of dry season because of the dilution factor of increased volume of rainfall which translate into more bouroghing activities of the worms. Similar reports of bioaccumulation of high concentration of heavy metals in aquatic lives are reported (Ademoroti, 1988 & 1995, Munson, Palmer, and Forn, 1976, Canli *et al.*, 1998, Woo, Yoke, and Wong, 1993, Weis and Weis, 1989 and Audu and Ibrahim, 2009).

Table1: ANOVA comparison of mean of metal concentration in Kano Lumbricolidae during dry season.

	Sum of the squares	Degree of freedom (df)	Mean of the squares	F _{cal}	F _{crit}	Significant level
Between Groups	0.171	6	0.02847	9.789*	2.44	0.0001
Within Groups	0.08144	28	0.002909			
Total	0.252	34				

*- Significant at 0.05 level

The above table shows that there is significant difference in the means of the metal concentration in lumbricolidae samples during dry season. ($F_{\text{cal}} = 9.789 > F_{\text{crit}} = 2.44$; $df = 6$, and 28; $P < 0.05$). Therefore the null hypothesis: HO₁ which state that there is no significant difference in the concentrations of heavy metals in the lumbricolidae samples during dry season in Kano is rejected. Hence there is significant

difference in the concentration of the metals in Kano lumbricolidae samples investigated during dry season and lumbricolidae samples from Kududufin Rariya were implicated to be most polluted. This might not be unrelated with fact that domestic wastes, Car wash, and the pond proximity to the burial ground.

Table 2: ANOVA comparison of mean of metal concentration in Kano Lumbricolidae during rainy season.

	Sum of the squares	Degree of freedom (df)	Mean of the squares	F _{cal}	F _{crit}	Significant level
Between Groups	0.194	8	0.02424	9.373*	2.18	0.0001
Within Groups	0.09308	36	0.02586			
Total	0.287	44				

*- Significant at 0.05 level

The table above shows that there is significant difference in the means of the metal concentration in Kano lumbricolidae samples investigated during rainy season. ($F_{\text{cal}} = 9.373 > F_{\text{crit}} = 2.18$; $df = 8$, and 36 ; $P < 0.05$). Therefore the null hypothesis; H_0 : which states that there is no significant difference in the concentrations of heavy metals in the lumbricolidae samples investigated during rainy season in Kano is rejected. Hence there is significant difference in the concentration of the metals in Kano lumbricolidae samples investigated during rainy season. Consequently lumbricolidae samples from Kudufin Farfajiya were implicated to be most polluted. This might not be unrelated with fact that domestic wastes, the pond proximity to the burial ground.

Conclusion

Based on this study, the ponds; Kudufin Farfajiya and Kudufin Rariya are indicted to be polluted. The levels of pollution might have been due to all forms of wastes; domestic, industrial and other types of waste chemicals products. This study therefore may serve as an important warning signal to stakeholders and government for necessary action.

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