PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 6 (6): 705-707, 2007
ISSN 1680-5194

Seasonal Variation in Heavy Metal Distribution in the Sediment of Major Dams in Ekiti-State

O.S. Adefemi, O. Olaofe and S.S. Asaolu
Department of Chemistry, University of Ado-Ekiti, Ado-Ekiti, Ekiti State, Nigeria

Abstract: Seasonal variation in heavy metal distribution of major dams in Ekiti State was carried out. Of all the metal examined, iron was found to be the most abundant metal for both seasons for the two years with an average value of 6.48 and 4.80m/100g (2001) and 6.51 and 3.62 mg/100g (2002) for dry and wet season respectively, the average metal concentration increased yearly. The concentration of most of the metals appears higher in the dry season than those recorded for the wet season. The values of the metals are below the standard limits of world health organization.

Key words: Heavy metal, sediments, dams

Introduction

Monitoring the concentration of heavy metals in the sediment is important since knowledge of the heavy metal levels in sediments gives vital information regarding their sources, distribution and degree of pollution. This is for the fact that sedimentation has been regarded as one of the most important fluxes in aquatic systems (Asaolu *et al*., 1997).

Sediments are significant in the assessment of the quality of aquatic system, because natural freshwater from lakes and dams have been the centre of important cultural developments since the earliest days of civilization. Consequence increased population, industrialization densities and agricultural activities, has passed a pollution threat in acute form on areas that depends mainly on natural and man-made lakes and dams as a major source of potable water (Kakulu, 1985). The enrichment of metals in sediments is influenced by allocthonous influence which is made up of natural and civilization effects and autochthonous influences comprising of precipitation, sorption, enrichment of organism and organometallic completing during sedimentation as well as the post depositional effects of digeneses (Forstner and Witlmann, 1979).

While some of these minerals (Fe, Ca, Cu, Na, etc) are essential nutrients that are required in enzymatic biochemical activities in the body, some others like Cu, Pb, As and Hg are extremely toxic even at low concentration (Kakulu and Osibanjo, 1988; Fagbemi and Oshodi, 1991).

Due to the significant of days world wide to human development, it is relatively important to monitor, the distribution of most important heavy metals in the system for which sediment form an important aspect because of its accommodative capability.

Dams being the major source of potable water in Ekiti State and the state being a new one where activities are increasing daily, this paper would be useful in monitoring the pollutional status of these dams in the state for environmental awareness. Since no such work has been reported, it is expected that the results would form base line data for future heavy metal pollutional status of the respected dams in the state.

Materials and Methods

Sediments samples were collected (for both dry and wet seasons) by divers at each dam sites for two seasons in a polythene bag that has been previously soaked in 10% HNO_3 and 1:1 HCl for 24 hours followed by rising with distilled water and then allowed to drain to dryness. 5g of the soil sediment sample was digested using Nwajei and Gagophien (2000) method. The resultant solution from the digest was analysed for heavy metals using atomic absorption spectroscopy (Buck model 200A). Results obtained were averages of replicated determinations.

Results and Discussion

Table 1, 2, 3, and 4 shows the heavy metal concentration for two season for both dry and wet. Cu, Cr and Cd were not detected in both season among the metals examined.

From the tables it was observed that the concentration of metals varies between the two seasons. In all cases, the average concentration of the metals were higher during the dry season than the wet season for both years. This is in good agreement with the study of heavy metals in water, sediment and fish sample from Ureje dam (Adefemi *et al*., 2004). It was also observed that there is a slight increased in the metal concentration from year to year (Table 1 and 3; 2 and 4).

Of all the metal examined, Iron was found to be the most abundant metal for both season with an average value of 6.48mg/100g and 4.90mg/100g (2001) and 6.51mg/100g and 3.62mg/100g (2002) respectively. The high Fe content (compared with other metals) in the

Table 1: Heavy metal concentration (mg/100g) in sediments in wet season (2001)

Dams	Zn	Fe	Cu	Cr	Cd	Pb	Mn
Ureje	3.34	2.02	ND	ND	ND	ND	2.05
Egbe	2.00	4.97	ND	ND	ND	ND	3.18
Ero	2.01	9.01	ND	ND	ND	0.80	0.72
Itapaji	0.95	3.56	ND	ND	ND	0.34	0.20
Mean	2.08	4.90	-	-	-	0.29	1.54
SD	0.98	2.95	-	-	-	0.30	1.34
±Cv(%)	47.07	60.20	-	-	-	102.02	87.26

Table 2: Heavy metal concentration (mg/100g) in Sediments in Dry season (2001)

Dams	Zn	Fe	Cu	Cr	Cd	Pb	Mn
Ureje	3.20	5.27	ND	ND	ND	ND	1.92
Egbe	2.80	8.09	ND	ND	ND	ND	1.37
Ero	3.23	6.94	ND	ND	ND	0.51	0.81
Itapaji	0.71	5.60	ND	ND	ND	0.03	0.33
Mean	2.49	6.48	-	-	-	0.14	1.11
SD	1.20	1.30	-	-	-	0.23	0.69
±Cv(%)	48.17	20.00	-	-	-	162.71	62.03

Table 3: Heavy metal concentration (mg/100g) in Sediments in Dry season (2002)

Dams	Zn	Fe	Cu	Cr	Cd	Pb	Mn
Ureje	4.56	10.92	ND	ND	ND	0.80	3.52
Egbe	1.70	7.50	0.03	ND	ND	0.44	4.30
Ero	2.05	4.37	ND	ND	ND	0.72	0.40
Itapaji	1.00	3.23	ND	ND	ND	0.48	0.72
Mean	2.33	6.51	0.0075	-	-	0.61	2.24
SD	1.55	3.45	0.013	-	-	0.18	1.96
±Cv(%)	66.57	53.04	173.21	-	-	29.02	87.50

Table 4: Heavy metals concentration (mg/100g) in sediments in wet season (2002)

Dams	Zn	Fe	Cu	Cr	Cd	Pb	Mn
Ureje	3.52	6.45	ND	ND	ND	1.00	4.73
Egbe	1.00	3.45	0.01	ND	ND	0.10	2.60
Ero	2.05	3.37	ND	ND	ND	0.05	0.43
Itapaji	0.98	1.23	ND	ND	ND	0.05	0.48
Mean	1.89	3.62	0.0025	-	-	0.41	2.06
SD	1.20	2.15	0.0043	-	-	0.30	1.34
±Cv(%)	63.36	59.39	173.20	-	-	107.43	100.0

sediment is excepted because it has been reported that Iron occurs at high levels in Nigeria soil (Asaolu *et al.*, 1997; Asaolu and Olaofe 2004 and Nwajei and Gagophien, 2000).

From the results obtained it could be observed that the metal concentration varies from one dam to another, this could be attributed to the geological distribution of minerals that varies from one location to the other. Similar variation was reported for heavy metal concentration in the sediment of some dams in plateau state (Egila and Nimyel (2002).

Among the metals detected Pb has the lowest concentration and the concentration was higher during the dry season for the two years, this may be as a result of efficient sedimentation since the water is only disturbed by tidal current during the dry season. All the metal examined are below the World Health Organization (1993) standard, but the dams should be closely monitored since there is usually slight increase in the concentration of the metals yearly. The result obtained in this study would serve as baseline data for present and future metal pollutional status in sediments of dams in Ekiti State.

References

Adefemi, O.S., O. Olaofe and S.S. Asaolu, 2004. Concentration of Heavy metals in water Sediment and fish parts (*Illisha africana*) from Ureje dam, Ado-Ekiti, Ekiti State, Nigeria. J. Biol. Phy. Sci., 3: 111-114.

Asaolu, S.S., K.O. Ipinmoroti, O, Olaofe and C.E. Adeeyinwo, 1997. Seasonal Variation in heavy metal distribution in sediments from Ondo State Coastal area. Ghana J. Chem., 3: 11-14.

Asaolu, S.S. and O. Olaofe, 2004. Biomagnification factors of some heavy and essential metals in sediment, fish and crayfish from Ondo State Coastal region. Bio-Sci. Res. Commu., 16: 33-39.

Egila, J.N. and D.N. Nimyel, 2002. Determination of trace metal speciation in sediments from some Dams in Plateau State. J. Chem. Soc. Nig., 27: 71-75.

Fagbemi, T.N. and A.A. Oshodi, 1991. Chemical Composition and functional properties of full fat floted pumpkin seed flour (*Telfeiria occidentalis*) Nig. Food J., 9: 26-32.

Forstner, U. and G.T.W. Witlmann, 1979. Metal pollution in the aquatic Environment, Berlin, Springer-Verlag.

Kakulu, S.E., 1985. Heavy metals in the Niger. Delta: Impact of Petroleum Industry on the baseline levels. Ph.D Thesis, University of Ibadan, Ibadan, Nigeria (unpublished).

Kakulu, S.E. and Osibanjo, 1988. Trace heavy metal pollutional status in sediment of Niger Delta area. Nig. J. Chem. Soc., 13: 9.

Nwajei, G.E. and P.O. Gagophien, 2000. Distribution of heavy metals in the sediments of Lagos Lagoon, Pak. J. Sci. Ind. Res., 43: 338-340.

World Health Organization, 1993. Guideline for Drinking Water Quality (WHO, Genevas).