World Wide Journal of Multidisciplinary Research and Development

WWJMRD 2017; 3(1): 1-3
www.wwjmrd.com
Impact Factor MJIF: 4.25
e-ISSN: 2454-6615

Salah Abdel Rahman Salih
Associate professor, Department of Agricultural Engineering, Faculty of Agricultural technology and Fish Sciences, University of Neelain

Mohamed Abdel Mahmoud Elsheik
Associate professor, Department of Agricultural Engineering, Faculty of Agricultural technology and Fish Sciences, University of Neelain

Babangida Haman
MSc student, Department of Agricultural Engineering, Faculty of Agricultural technology and Fish Sciences, University of Neelain

Correspondence:
Salah Abdel Rahman Salih
Associate professor, Department of Agricultural Engineering, Faculty of Agricultural technology and Fish Sciences, University of Neelain

Pollution of water by heavy metals in Gombe State Nigeria

Salah Abdel Rahman Salih, Mohamed Abdel Mahmoud Elsheik, Babangida Haman

Abstract
The research was conducted in Gombe State, Nigeria, in the period of 2014-2015 season to determine heavy metals content in water. The results showed that Gombe central had significant difference of Zn, Cu, Cd and Cr concentration than Gombe north and south zones. Fe content of the water at Gombe central recorded the highest followed by Gombe north, whereas, Gombe south recorded the lowest concentration. Also, Pb metal concentration at Gombe central was higher significantly than in Gombe north and Gombe south. On the other hand, there was no significant difference ($P \leq 0.05$) in Ni and As water content in the three zones.
At three different locations at Gombe north zone, Dukku, Kwami and Funakaye. Amount of Ni and As metals in the three locations were statistically the same, but there was significant different ($P \leq 0.05$) in water Zn, Cu, Fe, Cd, Pb and Cr metals content. At three different locations at Gombe central zone, Akko, Kwadon and Dadin-Kowa. The concentration of Ni shows significant different ($P \leq 0.05$), in which, Kwadon and Dadin-Kowa gave a highest values over Akko, whereas, Akko and Kwadon gave a higher concentration over Dadin-Kowa for Zn, Cu, Fe, Pb and Cr in water. At three different locations at Gombe south zone, Kaltungo, Billiri and Balanga. Zn, Cu, Fe, Cd and Pb did not differ statistically, Kaltungo and Balanga content higher amount than Billiri, but no significant difference Cr, Ni and as in the water.

Keywords: heavy metals, pollution, toxic chemicals, fresh water, ecosystems

Introduction
Heavy metals are elements having a density greater than $5g/cm^3$ in their elemental form (Bose and Hemantaranjan, 2005 ; Misra and Mani, 2009). Pollution of water still remains one of the most significant environmental problem. Water can be regarded polluted when it gets changed in its quality or composition either naturally or as a result of human activities so as to become less suitable for drinking, domestic, agricultural, industrial, recreational, wildlife and other uses for which it would have been otherwise suitable in its natural or unmodified state (Goel. 2009). In addition to toxic chemicals, water pollutants occur in many other forms, including pathogenic microbes, excess fertilizer and trash floating on streams, lakes and beaches (Calhoun, 2005).
Atmospheric deposition as a result of acid rain and dew is another natural source of heavy metal pollution (Nriagu, 1990). The contamination of fresh water with a wide range of pollutants has become a matter of great concern over the last few decades (Al-Weher, 2008). Discharge of heavy metals into rivers or any other aquatic environment can change both aquatic species diversity and ecosystems due to their toxicity and accumulative behavior (Al-Weher, 2008).
Lead (Pb) is a naturally occurring and found as a mineral combined with other elements such as sulfur and oxygen (Wuana and Okieimen, 2011). The maximum allowed contaminant level in the water is 0.01mg/l, the main sources of Pb in the environment include, dust from leaded pains from older houses, leaded gasoline and tap water from soldered pipes (Ediin, *et al*., 2000). Cadmium (Cd) is one of the big three heavy metal poisons and is not known for any essential biological function (Campbell, 2006). Cd is very bio persistent but has few toxicological properties and, once absorbed by an organism, remains resident for many years (Campbell, 2006). Chromium (Cr) is one of the less common elements and does not occur naturally in elemental form, but only in compounds. Major sources of Cr-contamination include releases from electroplating processes and the disposal of Cr containing wastes

(Smith, *et al*, 1996). Arsenic (As) occurs in a wide variety of mineral, exhibits fairly complex chemistry and can be present in several oxidation states (Smith, *et al.*, 1996). It is associated with skin damage, increased risk of cancer, and problems with circulatory system (Scragg, 2006).

Zinc (Zn) occurs naturally in soil, most of it is added during industrial activities, such as mining, coal and waste combustion and steel processing (Greany, 2005).

Iron (Fe), Copper (Cu), Mercury (Hg), Nickel (Ni) and Manganese (Mn) are have few toxicological properties and, once absorbed by an organism, remains resident for many years (Campbell, 2006).

Materials and methods

The research was conducted in Gombe State, Nigeria, in the period of 2014-2015 season. Latitude 9° 30- and 12° 30- N, longitude 8° 45- and 11° 45- E, 400-500 m above sea level (Yahya, 2005). The area is underlain by basement complex structure in the south and sedimentary Chad formation in the north-east part of the state (Umar, 2003). The study area lies mostly within the poor ground water in the sand stone. Annual rain fall 850mm and temperature ranges from $17C^{\circ}$-$42C^{\circ}$.

Water samples were collected from three zones, Gombe north, Gombe central and Gombe south. Samples were collected in a clean plastic bottle, then acidified for heavy metals analysis and transported to the laboratory, stored in frizzed for analysis and replicated three times.

Results and Discussion

Table (1) shows the mean concentration of Zn, Cu, Fe, Cd, Pb, Cr, Ni and As in the water. Gombe central had significant difference of Zn, Cu, Cd and Cr concentration than Gombe north and south zones. Fe content of the water at Gombe central recorded the highest water Fe, followed by Gombe north, whereas, Gombe south recorded the lowest concentration. Also, Pb metal concentration in water at Gombe central was higher significantly than in Gombe north, which in turn content higher Pb than Gombe south accordingly. On the other hand, there was no significant difference ($P \leq 0.05$) in Ni and As water content in the three zones.

Table (2) shows water samples heavy metals content at three different locations at Gombe north zone, Dukku, Kwami and Funakaye. Amount of Ni and As metals in the three locations were statistically the same, but there was significant different ($P \leq 0.05$) in water Zn, Cu, Fe, Cd, Pb and Cr metals content.

Table (3) shows water samples heavy metals content at three different locations at Gombe central zone, Akko, Kwadon and Dadin-Kowa. The concentration of Ni in water at different location shows significant different ($P \leq 0.05$), in which, Kwadon and Dadin-Kowa gave a highest values over Akko, whereas, Akko and Kwadon gave a higher concentration over Dadin-Kowa for Zn, Cu, Fe, Pb and Cr in water.

Table (4) shows water samples heavy metals content at three different locations at Gombe south zone, Kaltungo, Billiri and Balanga. The Zn, Cu, Fe, Cd and Pb metals in water at did not differ statistically for the three locations, but, Kaltungo and Balanga content higher amount for the above metals than in water samples at Billiri, but no significant difference between the three location for the concentration of Cr, Ni and As in the water.

Table 1: Heavy metals concentration in water at different zones (mg/kg)

Zones	Zn	Cu	Fe	Cd	Pb	Cr	Ni	As
Gombe north	1.06_b	0.32_b	2.29_b	0.25_b	0.14_b	0.08_b	0.03	0.02
Gombe central	1.50_a	0.56_a	4.06_a	0.49_a	0.25_a	0.20_a	0.08	0.04
Gombe south	0.91_b	0.25_b	3.52_b	0.09_b	0.05_c	0.02_b	0.03	0.02

Table 2: Heavy metals concentration in water at Gombe north (mg/kg)

Zones	Zn	Cu	Fe	Cd	Pb	Cr	Ni	As
Dukku	1.18_a	0.32_b	1.88_b	0.25_b	0.13_b	0.11_a	0.03	0.02
Kwami	1.25_a	0.29_c	2.93_a	0.31_a	0.09_b	0.08_b	0.08	0.04
Funakaye	0.76_b	0.36_a	2.06_b	0.18_c	0.21_a	0.02_b	0.03	0.02

Table 3: Heavy metals concentration in water at Gombe central (mg/kg)

Zones	Zn	Cu	Fe	Cd	Pb	Cr	Ni	As
Akko	1.75_a	0.68_a	4.29_a	0.42_b	0.26_a	0.21_a	0.06_b	0.03_b
Kwadon	1.81_a	0.69_a	5.24_a	0.63_a	0.32_a	0.28_a	0.10_a	0.06_a
Dadin	0.93_a	0.32_b	2.65_b	0.42_b	0.18_b	0.11_b	0.08_b	0.02_b

Table 4: Heavy metals concentration in water at Gombe south (mg/kg)

Zones	Zn	Cu	Fe	Cd	Pb	Cr	Ni	As
Kaltungo	0.63	0.18	2.17	0.07	0.04	0.02	0.01	0.01
Billiri	1.25	0.43	5.28	0.14	0.08	0.03	0.04	0.02
Bananga	0.84	0.14	3.11	0.06	0.04	0.01	0.03	0.01

Conclusion

The result from this study suggested that significant differences existed in the heavy metals concentration in water analyzed that might be in due part to the topogenetic variability and anthropogenic activities. The present study revealed that among the heavy metals studied, Cu, Cd, Cr, Ni and As were above the toxicity level in water.

References

1. Al-Weher, M. (2008). Levels of heavy metal Cod, Cu and Zn in three fish species collected from the northern Jordan Valley. Jordan Journal of biological sciences 1: 41-46.
2. Bose B., and Hemantaranjan, A. (2005). Development in physiology, biochemistry and molecular biology of

plants, New Delhi, India. New India publishing agency. Pp 105.
3. Calhoun, Y. (2005). Water pollution. New York: USA, Chelsea House publishers. pp: 1-7.
4. (4) Campbell, P.G.C, (2006). Cadmium – A priority pollutant, Environmental chemistry, vol. 3, no.6, pp: 387-388, View at publisher. View at Google Scholar. View at Scopus.
5. Ediin, G. ; Golantu, E. and Brown, M. (2000). Essentials for health and wellness. Toronto, Canada: Bartlett publishers. pp: 368.
6. Goel, P. (2009). Water pollution. New Delhi, India. New Age International. pp: 1-2.
7. Greany, K.M., (2005). An assessment of heavy metals contamination in the marine sediment of Las Perlas Archipelago, Gulf of panama, M Sc theses school of life science. Heriot-watt University of Edinburgh Scotland.
8. Misra, S., and Mani, D., (2009). Soil pollution. New Delhi, India: S.B Nangia APH publishing corporation. Pp 29-59.
9. Nriagu, J. O., (1990). The rise and fall of gasoline, science of the total environment 92: 13-28.
10. Scragg, A., (2006). Environmental Biotechnology, Oxford University Press, Oxford, UK, 2nd edition.
11. Smith, A. ; Means, J.L. and Chin, A. (1996). Remedial option for metals contaminated sates, Levis publisher, Boca, Ration Fla, USA.
12. Umar, Y. A., (2003). Problems of water scarcity consequences and possible solutions in Gombe metropolis, Gombe state. Poeing a B.Sc. Dissertation submitted to department of Geology, Bayero University Kano (unpublished).
13. Wuana, R.A. and Okieimen, F.E., (2011). Heavy metals in contaminated soil: A review of sources chemistry risks and best available strategies for remediation, ISRN Ecology, vol. 2011. Article ID 402647, 20 pages, doi: 10.540212011/402647.
14. Yahya, U.B., (2005). The impact of Fadama development project on the dry season farmers of Gombe State. An M.Sc., thesis in rural development, Federal University of technology Yola, unpublished thesis.