

Review of critical pollutants in Wastewater Samples along River Gwagwarwa in Kano State, Nigeria

Author(s), Ambrose E. Ekevwe

Abstract:

The quantity of water is continuously changing as a result of the reaction of water with contact media affected by anthropogenic influences, such as domestic, industrial, municipal wastes among others. Wastewater samples across River Gwagwarwa and also control samples (from dam used for potable water) were analyzed for critical pollutants. The result obtained for toxic organic pollutant in wastewater samples include dodecanoyl chloride (23.64%) and octadecanoyl chloride (52.51%) among non-toxic pollutants. While result obtained for control water samples include methyl esters which are practically non-toxic. Generally, the organic pollutants investigated in the wastewater sample are alarming, relevant authorities should identify the specific sources of this pollutants to deter it discharge into water or proper treatment before discharge.

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About Author

Author(s), Department of Chemistry, Federal College of Education (Technical)
Bichi, Kano State, Nigeria.

(Corresponding Author) **Email:** upambrose@yahoo.com

Introduction

Water is the most common liquid on our planet, vital to life form. The total water on earth is enormous $1.5 * 10^{18}$ metric tons, this quantity is 300 times larger than the mass of the entire atmosphere [1]. Unfortunately, most of these are not accessible because they appear in ice-caps, oceans, in underground aquifer (ground water-bearing beds) and some are even in the air as moisture. Only a small fraction of water is on earth surface and directly accessible to man as rivers, streams and spring[2].

Water can sometimes be said to be pure but it can never entirely 100% pure. it inevitably carries traces of other substances – various organic compounds, particles, gases, minerals and ions which impart to its physical, chemical and bacteriological characteristics[3].

In the cities of Nigeria,with particular reference to Kano state, a major industrial and commercial centre with a population of over 7,000,000 people according to the national census figure of 2006.The various component of the natural environment are often adversely affected by these human activities resulting in the devastation of components of the environment such as air, land and water[4].

The quantity of water is continuously changing as a result of the result of the reaction of the reaction of water with contact media affected by anthropogenic influences, such as domestic or municipal waste [5].

Study Site

River Gwagwarwa originate from Gwagwarwa quarter under Nassarawa local government area of Kano State.Gwagwarwa is a highly populated town in Kano. This is because of its semi-industrial nature and proximity to Sabon Gari (a densely residential and commercial settlement) in Kano. Therefore, the River cut across domestic, industrial and agricultural areas which makes it to carry along pollutant due to the activities of the areas it passes through.

Material and method

Water samples were collected at various points along River Jakara and River Rafin Malam in the morning and evening on each sampling day. 100 cm³ of water sample was collected at each designated point which is 20 metres to the next point. 10 samples were collected in each sampling session which are composited to a total of 1 litre. The samples were labeled and taken to the laboratory for further analysis. This procedure was repeated throughout the sampling. Appropriate quantities of the composite samples were measured and treated according to the standard methods of American Public Health Agency (APHA).

Procedure

50cm³ of each composite water sample was measured and added into a cleaned 250 cm³ separatory funnel. 50cm³ each of diethyl ether and trichloromethane were measured and added into the separatory funnel. The resultant mixtures were vigorously shaken and gas released intermittently by controlling the lid. The mixture was allowed to stand on a retort stand for 5 minutes and the organic layer was collected in a cleaned glass sample bottle, labeled and kept for further GC-MS analysis [7]. This process was repeated for all the composite samples.

Result and Discussion

Average percentage (%) value of organic compound detected at River Gwagwarwa wa samples.

S/NO	COMPOUND	% VALUE
1	Dodecanoic acid	1.77
2	Tetradecanoic acid	2.06
3	Palmitic acid	7.36
4	Methyl octadecanoate	4.92
5	Oleic acid	27.40
6	9- Octadecanoic acid 1,2,3 propanetriyl	32.55
7.	Octadecadienoyl chloride	52.51
8.	Hexadecanoic acid 1-{{{ 2- Aminoethylhydroxy phosphinyl}oxy}methyl} -1,2 Ethenediyl Ester	18.76
9.	Methyl Hexadecanoate	1.84
10.	Dodecanoyl chloride	23.64

The % values of the various organic compound detected in the composite water sample collected from River Jakara presented in the table above, ten different organic compounds were detected at different % value. The compounds fall within three classes of organic compounds viz, carboxylic acid, acid chlorides and esters. The distribution of the compounds depicts a pattern; carboxylic acid = esters > acid chlorides. Highest percentage value of 52.51 was recorded for octadecadienoyl chloride and the least % value of 1.77 was recorded for dodecanoic acid.

Exposures to Dodecanoic acid can cause mild irritation of the upper respiratory tract and mucous membrane at higher concentration which is in accordance with US Department of Health and Human Behaviour. While exposures to Octadecadienoyl chloride are very toxic and dangerous, it causes severe burns and eye damage. Human exposure present at level greater or equal to 0.1% is identified as probable or confirmed human carcinogen by International Agency For Research on Cancer (IARC).

This class of organic compound arises in the waste water due to the discharges of complex, chemicals and solvent used in industries, domestic and agricultural activities.

Average percentage (%) value of organic compound detected at control site.

S/NO	COMPOUND	% VALUE
1	Dodecanoic acid	1.83
2	Tetradecanioc acid	2.21
3	Palmitic acid	10.21
4	Methyl octadecanoate	8.26
5	Oleic acid	31.07
6	Docosanoic anhydride	9.58
7.	Octadecanoic acid 1,2,3 propantriyl Ester	36.78

The % value of the various organic compounds detected in the composite water sample collected from control site are presented in the above table. Seven different organic compounds were detected at different % value. The compounds falls within three classes of organic compounds viz, carboxylic acid, acid anhydride and esters. The distribution of the

compounds depicts a pattern, carboxylic acid > ester > acid anhydride. Highest percentage value of 36.78 was recorded for octadecanoic acid 1,2,3 propanetriyl esters and the least % value of 1.83 was recorded for dodecanoic acid.

Exposures to dodecanoic acid can cause mild irritation of the upper respiratory tract and mucous membrane at higher concentration which is in accordance with U.S Department of Health and Human Behaviour. While octadecanoic acid 1,2,3 Propanetriyl ester is a fatty acid methyl ester. Long chained fatty acid methyl ester are practically non-toxic. The non-toxic and safety of the fatty acid methyl ester is recognized by the U.S Food and Drugs administration.

These classes of organic compounds arise in the waste water due to the discharges of chemicals via agricultural operations. The control site has no activity except agricultural operation which includes livestock grazing, pesticide and fertilizer application among others.

Conclusion

Generally, the organic pollutants investigated in this study especially the organochloride are alarming and therefore need immediate attention to reduce the activities leading to the discharge in the environment. It is important that the relevant authorities should identify the specific sources of this orrganochorides and impose quick and stringent measures to deter there discharge into the water bodies and the environment in general.

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