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An analysis of Physical and chemical parameters in some rivers in Yobe state

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Abstract: *Water samples from six different areas in Yobe state will be physically, chemically and bacteriologically analyzed in order to ascertain the levels of pollution influence, Temperature, total dissolved solid(TDS), electrical conductivity, turbidity, colour and PH will be determined. Also to determine were chloride, calcium, manganese, sulphate, nitrate, fluoride,magnesium, iron, chromium (hexavalent), calcium, total hardness, and total coliform and escheridia coli. The concentration of pollution indicators ranged from 26.2 to 31.2oc for temperature, 0.06 to 0.23 ms/cm for electrical conductivity, 0.03 to 0.11 mg/l for total dissolve solid, 1.0 to 461 ofTU for turbidity, 12.0 to 550.0 ptco for colour, 0.17 to 3.30 mg/l for iron, 0.01 to 0.62 mg/l for chromium (hexavalent), 0.2 to 14.2 mg/l for manganese, 2.0 to 75 mg/l for sulphate, 1.6 to 35.8 mg/l for nitrate, 0.00 to 0.04 mg/l for fluoride, 0.3 to 24.5 mg/l for chloride, 0.668 to 0.668 mg/l for calcium, 0.160 to 0.290 mg/l for magnesium, 0.828 to 0.958 mg/l for total hardness, 6.0 to 7.0 for pH.*
Key words: *River water, quality, anion cat ion*

I. Introduction

Water is a finite resource that is very essential for the human existence, without any doubt, inadequate quantity and quality of water have serious impact on sustainable development. In developing countries, most of which have huge debt burdens, population explosion and moderate to rapid urbanization, people have little or no option but to accept water sources of doubtful quality, due to lack of better alternative sources or due to economic and technological constraints to treat the available water adequately before use (Calamari and Naeve, 1994; Aina and Adedipe, 1996). The scarcity of clean water and pollution of fresh water has therefore led to a situation in which one-fifth of the urban dwellers in developing countries and three quarters of their rural dwelling population do not have access to reasonably safe water supplies (Lloyd and Helmer, 1992). Drinking water that is safe and aesthetically acceptable is a matter of higher priority to National Authority for food and Drugs Administration (NAFDAC). Drinking water is satisfied fit for human comsuption by (NAFDAC) is expected to meet the World Health Organization (WHO) standard to be free from physical, chemical substance and micro-organism in the amount that could not be hazardous to health.

Assessment of water is not only for suitability for human consumption but also in relation to its agricultural, industrial, recreational, commercial uses and its ability to sustain aquatic life.

Water quality monitoring is therefore a fundamental tool in the management of freshwater resources. To underpin its importance, World Health Organization (WHO), United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO) and World Meteorological Organization (WMO) launched in 1977, a water monitoring programme to collect detailed information on the quality of global ground and surface water.

Water plays another role for man. It carries away his wastes. As the most abundant liquid on earth, water runs steadily to sea along a vast network of rivers. It is a receptacle for sewage, it can be used to rinse away grime or toxic chemicals; or remove waste heat from boilers (Tchobanoglous 1985).

Scientist discovered that there are 326 million cubic miles of water in the world, each one representing more than one trillion gallons. water is the major constituents of living matter and forms 50 to 90% of the weight of living organism's protoplasm. Water was also referred to as the most abundant chemical compounds; that occurs in three states: Solid (ice or snow), liquid (water) and gas (water vapour or stream). (Wilmot 1997).

II. Materials And Method

Materials
The material includes;

1. Spectrophotometer (DR/2000) HACH
2. Conductivity / TDS Meter
3. Incubator
4. Colony counter
5. Microscope

6. Vacuum pump
7. Auto clave
8. Oven
9. Hot plate
10. Membrane filter
11. Spatula
12. Absorbent pad
13. Dropper
14. Pipette
15. Conical flask
16. Petri Dishes
17. Beakers
18. Forceps
19. Weighing balance and cotton wool

Reagents

1. Mac Conkey agar
2. Distilled water
3. Ethanol
4. Ferro Ver iron reagent powder pillow
5. Chroma Ver – 3 – reagent powder pillow
6. Buffer powder pillow, citrate type
7. Sodium periodate powder pillow
8. Sulfa Ver – 4 – sulfate reagent powder pillow
9. SPADNS Reagent
10. Mercuric Thiocynate solution
11. Ferric ion solution
12. Calcium and magnesium indicator solution
13. Alkali solution
14. EDTA solution
15. pH Litmus paper

Sample Collection

The water sample will be collected in a sterilized container from six different rivers for the analysis.

LOCATIONOF SAMPLE COLLECTION

1. Sample A from Nguru river
2. Sample B from Katarko river
3. Sample C form Geidam river
4. Sample D from Gashua river
5. Sample E from Dagona river
6. Sample F from Ngaji river

Method

Analysis of water sample using Atomic absorption Spectrometer (AAS – DR 2000) or U-V/visible. About (13) parameters will be analyzed using the spectrometer. The parameters includes turbidity, colour, PH, iron, chromium (hexavalent), manganese, sulfate, nitrate, fluoride, chloride, calcium, magnesium, and total hardness respectively. While the total dissolved solid, electrical conductivity and temperature will be analyzed using conductivity/TDS meter as well.

III. Results And Discussion

The results under physical parameters were compared with the World Health Organization Standard in order to show the quality of the water from different sample collection areas in Yobe state. Considering the temperature of the samples at the period of the study falls within the range of 26.2°C to 31.2°C, this is because the nature of sahelian climatic condition of Yobe state.

In the analysis of electrical conductivity, which is a measurement of water capacity for converting electrical current and is directly related to the concentration of ion in the water, the range falls within the limits of World Health Organization Standard values. The results of total dissolved solid, was within the limits of WHO standard values. The turbidity which is mostly caused by the presence of suspended particles such as clay, silk, finely divided organic and in organic matters which makes the water to become muddy. It is also caused by industrial waste product and the growth of algae. Therefore, the turbidity of samples A, B, C and D as well as the colour of sample A, B, C and D exceeded the WHO standard values, except for sample E where the turbidity and colour respectively fall below the acceptable values. Colouration of water is caused by the presence of some metallic salts, organic matters and other dissolved material present. The chemical parameters were also compared with the standard values of (WHO).

Iron is one of the major components of the earth's crust occurs naturally in some ground water. The presence of the iron in the sample B, C and D were above the acceptable level of WHO. These values could cause poisoning in children and adults and affect the normal regulatory mechanism not to operate effectively. The chromium (hexavalent) in sample B, C and D exceeded the standard values of WHO and could cause cancer, inflammation of kidney and liver where as sample A and E have low level of chromium and could cause irritation of gastro intestinal mucosa to occur. The presence of manganese in sample A, B, C, D and E where within the range of WHO standard, while sample A, B, C, D and E have sulphate, nitrate, fluoride, chloride, calcium and magnesium concentration below the WHO standard except for total hardness which cause corrosion of pipes.

The PH value of sample B, C, D and E all falls within the acceptable values except sample A which has PH of 6.0 which is below the WHO standard.

IV. Conclusion

The analysis of water sample from various locations in Yobe state, shows that the physicochemical parameters of most of the water sample collected were contrary to the value set by World Health Organization, therefore the result from this study clearly demonstrate that the water quality from rivers in Yobe state are unfit for human consumption there is urgent need to develop some form of local treatment to purify the waters for people of yobe state and other places in Nigeria. This will help go a long way to ensure that the Millennium Development Goals (MDGs) are achieved by 2015.

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Table i. Physical parameters of water samples collected from different areas in Yobe state compared with (WHO) standard of physical parameters (1984).

Parameters	Sample A Nguru	Sample B Katarko	Sample C Geidam	Sample D Gashua	Sample E Ngaji	(WHO) Standard
Temprature (°C)	31.2	28.3	27.7	26.9	26.2	
Electrical Conductivity (mS/cm)	0.23	0.07	0.06	0.09	0.05	14.0
TDS (mg/l)	0.11	0.04	0.03	0.04	0.04	1,500
Turbidity (FTU)	10.0	101.0	461.0	83.0	1.0	5.0
Colour (pt co)	36.0	422.0	550.0	446.0	12.0	15.0

Table ii

Table ii, shows the World Health Organization standard of Physical Parameters (1984).

Parameters	Acceptable Level	Effect Above/Below Effect
Temperature (°C)	--	--
Electrical conductivity (mS/cm)	14.0	--
Total Dissolve Solid (mg/l)	1500	--
Turbidity (FTU)	5.0	VISUAL
Colour (Pt co)	15.0	VISUAL

Table iii. Shows the chemical parameters of water samples from different areas in Yobe state

Parameters (Mg/L)	Sample A Nguru	Sample B Katarko	Sample C Geidam	Sample D Gashua	Sample E Ngaji	(WHO) Standard
Iron	0.17	3.30	2.38	2.65	0.65	1.0
Chromium (Hexavalent)	0.03	0.13	0.62	0.09	0.01	0.05
Manganese	0.02	2.2	14.2	1.3	0.5	0.05
Sulphate	29.0	29.0	75.0	15.0	2.0	400.0
Nitrate	35.8	2.0	6.7	4.0	1.6	50.0
Fluoride	0.00	0.00	0.00	0.00	0.04	1.5
Chloride	6.2	8.8	24.5	2.5	0.3	250.0
Calcium	0.668	0.668	0.668	0.668	0.668	250.0
Magnesium	0.290	0.220	0.160	0.290	0.230	50.0
Total Hardness	0.958	0.888	0.828	0.958	0.898	60.0
PH	6.0	7.0	7.0	7.0	7.0	6.5-8.5

Table iv. The Table below shows the World Health Organization standard of chemical parameters (1984)

Parameters (Mg/L)	Acceptable Level Mg/L	Effect Below Level	Effect Above Level
Iron	1.0	Reduces production of blood, but no adverse effect on human	Poisoning in children, in adults, normal regulatory mechanism do not operate effectively
Chromium (Hexavalent)	0.05	Irritation of gastro intestinal mucosa	Cancer, inflammation of kidney and liver, bone and tissue death and death in human
Manganese	0.05	Anaemia and bone changes in children	No apparent adverse effect on man,
Sulphate	400.0	Physiologically harmless	corrosion in metals and causes purging in human
Nitrate	50.0	No effect on health	Blood disease and death in infant, liver and kidney inflammation in children
Fluoride	1.5	No effect on health	Causes tooth decay in both child and adult, also causes kidney disease, cancer.
Chloride	250.0	___	____
Calcium	250.0	___	No adverse Health effect
Magnesium	50.0	___	No adverse Health effect
Total Hardness	60.0	Corrosion of pipes, causes heavy metals to be found in water, deposit crust on kitchen utensils and domestic disadvantage	No adverse Health effect
PH	6.5 – 8.5	___	___