THE ANALYSIS OF NITRATE CONTENT AND DETERMINATION OF PHYS1COCHEMICAL PARAMETERS IN GROUND WATER OF MUBI NORTH LOCAL GOVERNMENT AREA OF ADAMAWA STATE

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Abstract

Analysis of nitrate content in water and determination of some pysiocochemical properties in Mubi North was carried out in Mubi Local Government Area of Adamawa state of Nigeria. The study of the nitrate .content was carried out via observance measurement. The physical parameters measured were pH, temperature and conductivity. In this investigation, the pH was found to be between the range of 7.0-7.9, the highest temperature recorded in this analysis was 29°c and this was in a hand dug well in Shu ware while the lowest came from a mining stream in Vimtim. Conductivity measurements showed that activity was at its highest in blue house, where a deep borehole is located with a conductivity of 12.0umhs/cm and lowest of 2.Gums/cm at a running stream in Vimtim. Water samples were taken from deep hole dug well and running streams. The maximum detected limit was at its highest at a hand dug well at Yelwa whereas the lowest was from a running stream at Vimtim with a value range of 0.6mg/l. This reveals that study area conforms to the World Health Organizations standards of nitrate content of not more than 45mg/l.

Introduction

Mubi is the second largest city in the state at a distance of 240km from the capital, Yola. Mubi North local government has the highest population density in the region with a density of population of 298.8 persons per square kilometer using 2003 population projection (Gadiga, 2004). The region is least in terms of modern Industries and the availability of surface water varies from time to time. The climate controls water that is available both at the surface and the sub-surface at a given time, during the wet season (May to September), water is usually abundantly available both at the surface and surface. Virtually, all the rivers are dry during the dry season (Adebayo, 2004).

Trioxonitrate (V) ion enters natural waters through various sources such as rock, mineral, fertilizer run off and leguminous plants (Anderson, 1961). The threshold unit of nitrate is high because of its solubility in water and potential sources of nitrate are lulushate (William et al, 2008).

Nitrate is present in natural water but over the years, it's concentration in both ground and surface waters have increased in some areas. Sizeable population of the land mass in. Mubi North Local Government area and environs is essentially used for agricultural activities. The areas have high density of animal confinements, rocks, and plain sands. Hence the high rate of penetration, thereby making it possible for nitrate carried in flood from highly chemically fertilized soils (Abulude, 2004).

Drinking water containing more than 50ppm nitrate cause health problem in infants (Kumar 1992). The objective of the present study was to document the physicochemical characteristics (pH, Conductivity and temperature). A spectrometric procedure has been widely adopted as a standard method for the determination of macro, micro and semi micro amount of nitrate in drinking water (Kumar 1992). The investigation made use of observance measurements using UV/visible spectrometer 410nm (Gary, 2004).

Materials and Methods

Study Area:

The study was carried out between may to September 2008 in Mubi North Local Government Area of Adamawa state, about 240km from the state capital, Yola. The samples were collected from deep boreholes, shallow wells and running springs, deep boreholes are those that are dug up to the depth of about 500m below the surface, whereas the shallow wells are somewhere between 2-8m deep from the earth's surface and also running streams. Water Sampling:

Water samples were collected randomly within Mubi North Local Government Area. The physical parameters were measure, the temperature pH and conductivity, sample from different sites were analyzed and these were of three categories, viz the deep borehole, the dug well and running

streams.

The water samples were collected with cleaned $100cm^3$ polythene bottles and were preserved with 8.0ml tetraoxosulphate (vi) acid per liter.

The temperature of the surface water was measured by means of a mercury thermometer. The pH of the water sample was measured using jen- way 3505 conductivity meter and the results were expressed in micrometer per centimeter.

Method

100ml of water sample was measured and transferred into 150ml evapourating dish in a heating mantle and evaporated to dryness. 2.0ml phenoldislhonic acid, 20ml distilled water and 7.0ml ammonia (NH_3) was added until maximum colour was developed. The solution was filtered with Whatman number 1 filter paper and transferred into a 50ml volumetric flask. This was further diluted with distilled water to make a mark. A standard curve was prepared using a known nitrate solution.

Stock nitrate solution was prepared by measuring 1.65g of KNo_3 using an electronic weighing balance and dissolved in a beaker. This was transferred into a 1000ml volumetric flask to make 100ppmNo_3"and made to mark with distilled water.

The absorbance measurements were carried out by using a blank reagent prepared with 2.0ml phenoldisulphonic reagent, 7.0ml ammonia (NH_3) and added into 50ml volumetric flask and made to mark with distilled water. The intensity of the colour and hence the absorbance was proportional to the nitrate concentration in the sample and bears a linear relationship. The maximum wavelength of 410nm(Gary, 2004).

Results

Table I: The results of Physico-chemical Parameters of Mubi North are as Follows

a. Water Temperature, pH, and Conductivity

S/No.	Locations	Sources	Temperature °C	PH	Conductivity (umhs\cm)
I,	Blue House	Deep Borehole	28	7.2	12.0
2.	Digil	Deep Borehole	29	7.3	11.0
3.	Digil	Dug well	29	7.2	8.0
4.	Koch i fa	Deep Borehole	29.5	7.4	7.0
5.	Kolere	Deep Borehole	29.5	7.5	8.0
6.	Lokuwa	Dug well	28	7.7	12.0
7.	Muvuldi	Dug well	28	7.2	11.0
8.	Shuware	Dug well	29	7.3	10.0
9.	Wuro Bulude	Deep Borehole	28	7.5	12.0
10.	Yelwa	Dug well	29.5	7.9	13.0
11.	Vimtim	Dug well	28	7.1	4.5
12.	Vimtim	Running stream	27	7.0	2.0

Standard Nitrate Solution and Absorbance

S/No.	**Standard Nitrate Ion in ppm**	**Absorbance at 410nm, (1.00 cm cuvette)**
	Blank	**0.00**
	Standard	-
1.	**50**	**1.586**
2.	**40**	**1.367**
3.	**30**	**0.924**
4.	**20**	**0.699**
5.	**10**	**0.313**

c. Water Samples and Absorbance

S/No.	Locations	Sources	Absorbance at 410mm
1.	Blue House	Deep Borehole	0.245
2.	Digil	Deep Borehole	0.244
3.	Digil	Dug well	0.301
4.	Kochifa	Deep Borehole	0.160
5.	Kolere	Deep Borehole	0.162
6.	Lokuwa	Dug well	0.628
7.	Muvuldi	Dug well	0,688
8.	Shuware	Dug well	0.502
9.	Wuro Bulude	Deep Borehole	0.441
10	Yelwa	Dug well	0.790
11.	Vimtim	Dug well	0.301
12.	Vimtim	Running stream	0.092

d. Nitrate in Milligram Per Liter

S/No.	Locations	Sources	$\|No_3\|$mg/l	WHO No_3ms/l Standard
1.	Blue House	Deep Borehole	8.0	45
2.	Digil	Deep Borehole	8.0	45
3.	Digil	Dug well	10.0	45
4.	Kochifa	Deep Borehole	5.0	45
5.	Kolere	Deep Borehole	19.0	45
6.	Lokuwa	Dug well	20.0	45
7.	Muvuldi	Dug well	21.0	45
8.	Shu ware	Dug well	16.0	45
9.	Wuro Bulude	Deep Borehole	14.2	45
10.	Yelwa	Dug well	25.0	45
11.	Vimtim	Dug well	10.0	45
12.	Vimtim	Running stream	0.60	45

Nitrate in water as obtained from study areas compared with WHO Standard.

Table li: The results of physioco-chemical parameters of Mubi South are as follows:

Water Temperature pH and Conductivity

a.

S/No.	Locations	Sources	Temperature °C	pH	Conductivity (umhs\cm)
1.	Arhankunu	Dug Well	28	7.2	7.0
2,	Army Barrack	Deep Borehole	27.5	7.0	5.0
3.	Gella	Deep Borehole	29	7.3	8.0
4.	Gella	Dug Well A	28	7.4	8.2
5.	Gella	Dug Well B	28.5	7.4	8.5
6.	Kwaccham	Dug Well	29	7.9	6.7
7.	Lamorde	Dug Well	27	7.3	9.2
8.	Mugulvu	Deep Borehole	29	7.1	6.5
9.	Madanya	Deep Borehole	28.5	7.8	5.6
10.	Nagavahi	Deep Borehole	28.2	7.0	4.0
11.	Sebore	Dug Well	28	7.5	9.2
12.	Wuro Patuji	Dug Well	29	7.9	10.2

Standard Nitrate Solution and Absorbance

S/No.	**Standard Nitrate Ion in ppm**	**Absorbance at 410nm, (1.00 cm cuvette)**
	Blank	**0.00**
	Standard	-
1.	**50**	**1.620**
2.	**40**	**1.402**
3.	**30**	**0.962**
4.	**20**	**0.721**
5.	**10**	**0.323**

c. Water Samples and Absorbance

S/No.	Locations	Sources	Absorbance at 410mm
1.	Arhankunu	Dug Well	0,660
2.	Army Barrack	Deep Borehole	0.048
3.	Gella	Deep Borehole	0.582
4.	Gella	Dug Well A	0.620
5.	Gella	Dug Well B	0.640 .
6.	Kwaccham	Dug Well	0.690
7.	Lamorde	Dug Well	0.640
8.	Mugulvu	Deep Borehole	0.325
9.	Madanya	Deep Borehole	0.320
10	Nagavahi	Deep Borehole	0.020
11.	Sebore	Dug Well	0.628
12.	Wuro Patuji	Dug Well	0.690

d. Nitrate in Milligram Per Liter

S/No.	Locations	Sources	$[No_3]m_K/l$	WHO No_3mg/l Standard
1.	Arhankunu	Dug Well	20.1	45

2.	Army Barrack	Deep Borehole	1.10	45
3.	Gella	Deep Borehole	18.0	45
4.	Gella	Dug Well A	19.0	45
5.	Gella	Dug Well B	20.0	45
6.	Kwaccham	Dug Well	21.5	45
_ 7 ^	Lamorde	Du£_Well	20.0	45
8.	Mugulvu	Deep Borehole	10.1	45
9.	Madanya	Deep Borehole	10.0	45
10.	Nagavahi	Deep Borehole	0.90	45
11.	Sebore	Dug Well	20.1	45
\YL~~	Wuro Patuji	Dug Well	20.3	45

Nitrate in water as obtained from study areas compared with WHO Standard.

Discussion

On the basis of water sample obtained from different sources, only underground waters (deep boreholes, dug wells and running streams) contained appreciable nitrate levels. The results obtained as presented in Table 1 (d) for the samples from different locations Table 1 (a and d) shows the physical parameters of the samples, while Table 1 (b and c) shows the standard and absorbance measurements respectively.

Water has several unique properties that combine to minimize temperature changes. Therefore, the range of variation of water temperature is smaller and changes occur more slowly in water than in the air (Sana, 1983).

pH indicate the concentration of hydrogen ions. It may be stated that per liter, water is a weak electrolyte, a small fraction of it dissociates into hydrogen ion H^+ and hydroxyl ion OH" makes. H^+ makes for the aciditv where as OH*tvnir*fl1 HaciV

$$H_2O \rightleftharpoons H^+ + OH^-$$

Consequently, the pH values in the sample vary from 7.0 to 7.9 m the table 1 (a).

Equally important is the conductivity measurements. Conductivity is a numerical expression of the ability of an aqueous solution to carry an electrically charged current. This ability depends on the presence of ions, their total concentrations, mobility and valences.

However, maximum and minimum variations in water samples obtained from various locations in Mubi North were 14.0 and 2.0 respectively. All measurements were in micrometer per centimeters.

Conductivity is an important nutritional factor and the quality of any water resources is indicated by its conductivity and hence the productivity of the system. (Ganapati, 1960), pointed out that the tropical waters particularly non-polluted waters are deficient in nitrate content.

Nitrate content in drinking water, more especially in ground water is a prominent problem in many parts of the country. The nitrate content in water samples obtained from Mubi North varies from 0.6 to 25.0 mg/1. These are all within the desirable limits of 45mg/l of the world health organization.

Conclusion

Mubi North Government Area of Adamawa state Nigeria reveals low concentration of nitrate in drinking water obtained from various sources namely, running streams dug wells and boreholes. The highest nitrate concentration was obtained from the Yelwa (Shown on the map), which is actually safe and far below the world health organization's 45mg/l.

Wells should be dug, deep at least 30m away from pit latrines, internally ringed with concentrate and raised at least two meters above the ground level. Both surface and ground water should be treated before use.

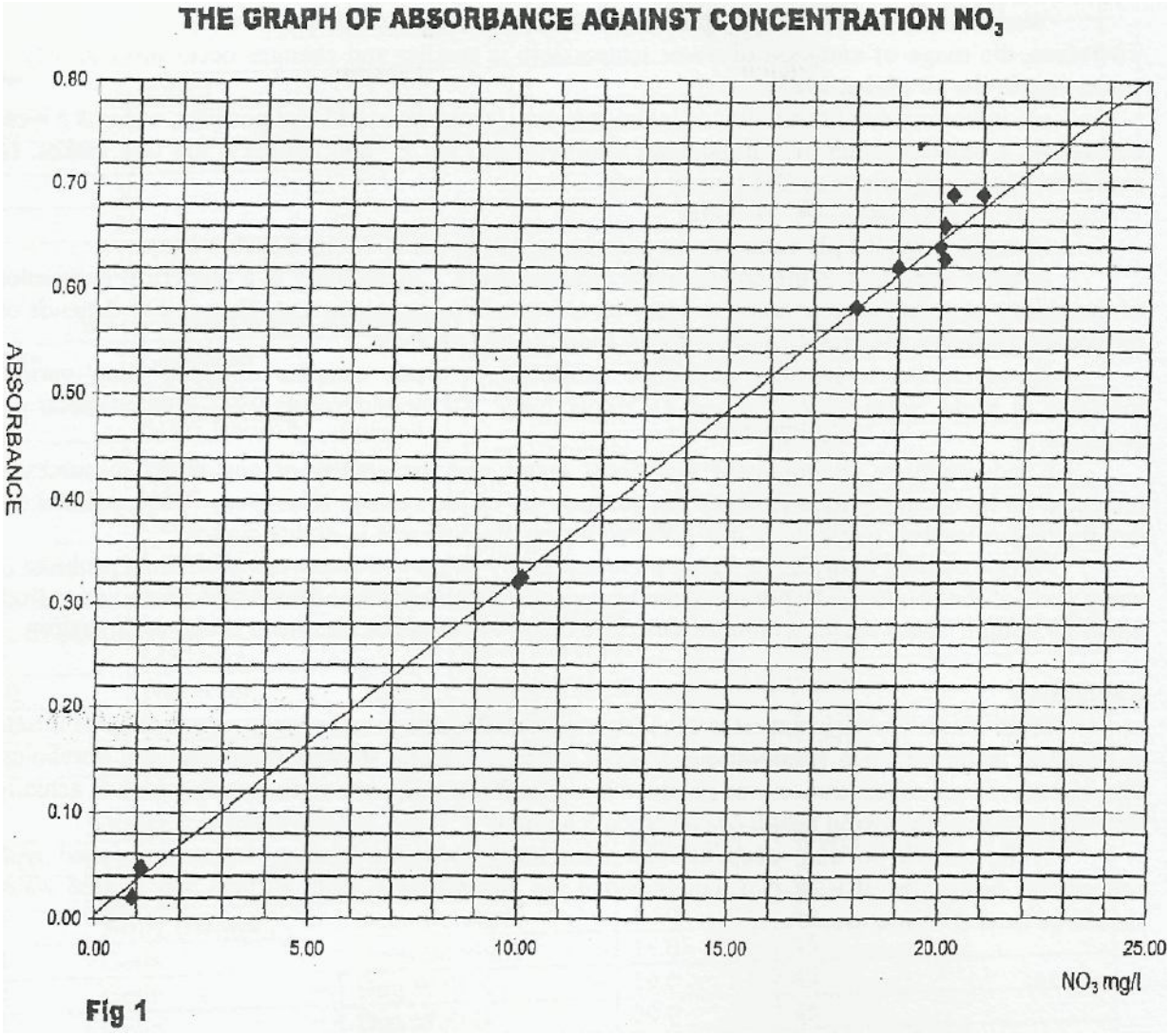

Fig 1

References

Adebaye A.A. (2004). Mubi Region, a geographical synthesis, department of geography, Adamawa state University Mubi.

Anderson E. & Thomas E.J (1961). Nitrate in our Surrounding water resources, *Journal of American Water Work Association,* 53:63-69.

Adeyeye E. I. & Abulude F.O (2004), Analysis assessment of some surface and ground water resources in Ile-Ife, Journal *Chem., Society of Nigeria,* 29(2): 98-108.

Bard Cohn (2008). *Environmental chemistry* third edition 480-483.

Christian D.G (2004). *Analytical Chemistry* Soctle Edition. University of Washington 766-767.

Ganpatil S.V.C (1960). *Ecology of tropical waters pore, syrup.* Algologist I.C.A.R, New Delhi 214-218.

Kumar R. Siddiqi, M. Fasali S. Haldar B. & Prenossma R. (1992). *Carcinogenesis* 13:1331.

Sana L.C (1983). A Comparative physicochemical properties of pond & Riverine water at Bhagalpur eco 5:49-52.

William E.S Robill &' P.A Sunstock R.B (2008). Nitrate in drinking water, http//www.age.psu.edu.penn state.