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DETERMINATION OF PHYSICOCHEMICAL CHARACTERISTICS OF WATER IN MUBI SOUTH LOCAL GOVERNMENT AREA OF ADAMAWA STATE

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ABSTRACT

The physiochemical properties of water from three different types of water sources were analysed. Water samples were collected from the three types of sources namely: dug wells, deep boreholes and running streams and analysed for conductivity, pH and temperature respectively in Mubi South Local Government Area of Adamawa State. In all the samples the pH was found to be neutral or slightly alkaline, that is between 7.0 – 7.9 depending on the source of water. The highest pH of 7.9 was obtained from Wuro Patugi and Kwaccham respectively. Conductivity measurements also revealed values of 10.2μmhs/cm at a dug well in Wuro Patugi, whereas a minimum of 4.0 μmhs/cm was obtained from a borehole at Ngavah all in Mubi South Local Government Area of Adamawa State. Further analyses were carried out in the nitrate content of water samples from the three sources of water available in Mubi South Local Government Area of Adamawa State. The result obtained also showed that the maximum nitrate content of 21.5mg/L was from a dug well in Kwaccham at a temperature of 21^{o}C whereas a minimum of a negligible 1.10mg/L was observed in the case of a deep borehole located in Army Barracks at a temperature of 27.5^{o}C. Also carried out was absorbance measurements of the samples obtained from the various sources.
Key wards: - *Physiochemical properties, Nitrate, Drinking water, Mubi south.*

INTRODUCTION

Trionitrate (v) ion enters the natural waters through various sources such as rock minerals, fertilizer run offs and leguminous plants (Anderson, 1961). The threshold limit of nitrate is high because of its high solubility in water. The presence of nitrate in excess of few milligrams per liter in drinking water constitute ground water for the rejection of the supply because the toxic qualities has been recognised as early as the Eleventh century (Thomas, 1961). Nitrate is relatively toxic at high concentration and its consumption can have damaging effect on both plant and animals. Nitrate is present in both ground and surface waters but over the years its concentration in both ground and surface waters have increased in some industrial towns. (Abulude 2004). Sizeable proportion of the Landmass in Mubi South 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 increase in the rate of penetration thereby making it possible for nitrate being carried in flood from highly chemically fertilized soils (Abulude 2004). The inorganic contaminants if greatly concern in ground water is the nitrate ion, which commonly occurs in both mired and suburban aquifers (ground water in saturated zones). Although uncontaminated ground water generally has nitrate – nitrogen levels of less than 2ppm, these are generally less contaminated because of their depth, because their location is remoted in respect to large

source of contamination, and because natural remedication be denitrification in the low-oxygen conditions can occur. In recent years, nitrate (No_3) in drinking water has been a source of concern. Recently, fears about the increasing level of nitrate ion in drinking water particular in well water in rural locations. The main source of nitrate ion is runoff from agricultural activities in rivers and streams. Initially oxidized animal waste (manure) and unabsorbed ammonium nitrate and other fertilizers account for the remainder. Nitrogen unabsorbed by plants is often converted naturally to nitrates, which is highly soluble in water. It is also absorbed that intensive cultivated of land even without application of manure or fertilizer, facilitates the oxidation or conversion of nitrogen to nitrate in decomposed organize matter in the soil by providing aeration and moisture . In urban areas the sources of nitrate contaminated are septic tanks, domestic lawns and golf course parks. The objective of the present study was to document water analysis based on physical and chemical characteristic (pH, Conductivity, Temperature).

MATERIALS AND METHODS

Study Area

The study was carried out in the wet season between the months of May to September 2008 in Mubi South Local Government Area of Adamawa State 240kilometers from state capital Yola. According to the 2003 population projection Mubi South has a population density of 187.2 per square kilometers (Gadiga, 2001). Mubi is situated at lower contour of Mandara Mountains, separating Nigeria from Cameroon (Balla, 2004). The climate controls the amount of water that is available at the surface and subsurface at a given time. Virtually all rivers are dry, during the dry season (Adebayo, 2004).

Water Sampling

Water samples were collected randomly within Mubi South Local Government Area. These were then cleaned with $1000cm^3$ polyethylene bottle and were preserved with 8.0ml tetraoxosulphate (VI) acid per litre before further analysis. The physical parameter which included temperature, conductivity and pH were promptly carried out. The temperature was measured by means of mercury thermometer. pH was measured using Jenway 3505pH meter while conductivity measurement were carried out using Jenway 3505 conductivity meter all at laboratory of Adamawa State University Mubi.

METHOD

A blank reagent was prepared with 2.0ml phenoldisulfonic reagent, 7.0ml ammonia (NH_3) were added into 50ml volumetric flask and made to mark with distilled water. The intensity of the colour and hence the absorbance is properties to the nitrate concentration in the sample and bears a linear relationship. Maximum absorbance was obtained at a wavelength of 410mm (Gary, 2004). Thus, the analysis was carried out using a uv spectrophemeter.

RESULTS

The results of physicochemical properties or parameters are seen in Table 4a. Table 1(b) indicates the nitrate concentration and absorbance at some standard nitrate ion concentration. Whereas in table Ic sample absorbance reading can be obtained at various sample locations.
Table Id. indicates the nitrate concentration at various locations.

Table Ia: Water temperature pH and conductivity.

S/No	LOCATIONS	SOURCES	TEMPERATURE °C	pH	CONDUCTIVITY (μmhs/cm)
1.	Archankuru	Dug well	28	7.2	7.0
2.	Army Barracks	Deep borehole	27.5	7.0	8.0
3.	Gella	Deep borehole	29	7.3	8.2
4.	Gella	Dug well A	28	7.4	8.5
5.	Lamurde	Dug well B	28.5	7.4	6.7
6.	Kwacham	Dug well	29	7.9	9.2
7.	Nuguldi	Dug well	27	7.3	6.5
8.	Madanya	Deep borehole	29	7.1	5.6
9.	Ngavahi	Deep borehole	28.5	7.8	4.0
10.	Sebore	Deep borehole	28.2	7.0	9.2
11.	Gella	Dug well	28	7.5	10.2
12.	Wuro Patugi	Dug well	29	7.9	10.2

Table Ib: Standard nitrate and absorbance

S/No	Standard nitrate ion in PPM	Absorbance at 410mm (1.00cm Curette)
(1)	Bank	0.00
	Standard	-
1	50	1.620
2	40	1.402
3	30	0.962
4	20	0.721
5	10	0.323

Table Ic: Samples and Absorbance.

S/No	LOCATIONS	SOURCES	Absorbance at 410mm
1.	Archankuru	Dug well	0.660
2.	Army Barracks	Deep borehole	0.048
3.	Gella	Deep borehole	0.582
4.	Gella	Dug well A	0.620
5.	Lamurde	Dug well B	0.640
6.	Kwaccham	Dug well	0.690
7.	Nuguldi	Dug well	0.640
8.	Madanya	Deep borehole	0.325
9.	Magavahi	Deep borehole	0.320
10.	Sebore	Deep borehole	0.020
11.	Gella	Dug well	0.628
12.	Wuro Patugi	Dug well	0.690

Table Id: Nitrate in Milligram per litre

S/No	LOCATIONS	SOURCES	$[No_3]$ mg/L	WHO$[No_3]$ mg/L Standard
1.	Archankuru	Deep borehole	8.0	45
2.	Army Barracks	Deep borehole	8.0	45
3.	Gella	Dug well	11.0	45
4.	Gella	Deep borehole	5.0	45
5.	Lamurde	Deep borehole	19.00	45
6.	Kwaccham	Dug well	20.00	45
7.	Muguldi	Dug well	22.00	45
8.	Madanya	Dug well	16.00	45
9.	Nagavahi	Deep borehole	14.20	45
10.	Sebore	Dug well	25.00	45
11.	Gella	Dug well	10.00	45
12.	Wuro Patugi	Running stream	0.60	45

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

DISCUSSION

Underground water of three sources of the study area shows appreciable nitrate contamination. These sources included deep borehole, dug well can be seen in table I for samples from different locations of the study area. The physical parameters are shown in table II. The highest activity is seen in the case of Wuro Patugi, dug well with a conductivity of 1.2 μmhs/cm. pH is an indication of the hydrogen ion concentration. Water is known to be a weak electrolyte, a small fraction of it dissociates into hydrogen ion. Therefore range of variation of water temperature is smaller and changes occur more slowly in water than in air (Saha, 1983)[6]. In all water is between 7.0 – 7.9 with tolerable pH. Conductivity is a numerical expression of the ability of an aqueous solution to carry an electric charge current. This ability depends on the presence of dissolved ion, total concentration, valences and mobility. In the study area, the highest activity of 13.0μms/cm. was seen in the case of a dug well at

Yelwa and Lower activity of 2.0μms/cm. at a running stream at Vimtim. Conductivity measurements constitute an important factor and this indicates the productivity of the system (Ganapti, 1960). The occurrence of high levels of nitrate in ground water is a prominent problem in many parts of the country. More so, nitrate content in drinking water is considered to have its adverse effects. Meanwhile, the study area (Mubi South) is between the ranges or variations of 0.9 to 21.5mg/L. Furthermore, from the results, these values are within limits specified as safe by the WHO.

CONCLUSION

Water source in the study are namely Mubi South Local Government Area of Adamawa State reveals no source with excessively high nitrate concentration. The highest nitrate concentration was obtained from a dug well at Yelwa as shown in the map of the study area of about 25.0mg/L. In this the WHO organisation standard is far above the concentration obtained at Yelwa. Physical properties have a great influence on the availability of nitrate. In which areas where the presence of activity is seen, the nitrate concentration was largely affected. Wells should be dug deep at least 30m away from pit latrines, internally hugged with concrete and raised at least two meters above the ground level. Both ground and surface water should be treated before use. Therefore, frequent monitoring of our water sources used by the public is very important as it helps establish the suitability of the water for human consumption.

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