INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD ISSN: 2455-0620 Volume - 5, Issue - 8, Aug – 2019
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value: 86.87 Impact Factor: 6.497
Received Date: 08/08/2019 Acceptance Date: 18/08/2019 Publication Date: 31/08/2019

INVESTIGATION OF PHYSIOCHEMICAL CHARACTERISTICS OF GROUND WATER FROM TOUNGOO (MYANMAR)

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Abstract: *Groundwater can contain many constituents including microorganisms, gases, inorganic and organic materials. Industrial and agricultural activities are major sources of contamination. These activities can lead to contamination of well water, municipal drinking water sources and the environment. Due to human and industrial activities the ground water is contaminated. This is the serious problem now a day. Thus the analysis of the water quality is very important to pressure and prefect the natural ecosystem. This study was aimed at assessing the ground water quality characteristics in Toungoo, Bago Region in Myanmar. The comprehensive physicochemical analysis was conducted after the ground water samples were collected from different locations. The physicochemical parameters such as pH, electrical conductivity, total hardness, total alkalirity, calcium, magnesium, sodium, potassium, carbonate, bicarbonate were investigated. Moreover, cholide, sulphate, iron, lead, magnese, and zinc were also determined.The results were compared with standards prescribed by WHO (1993). It was found that the water samples collected from raining season showed contamination. All samples* showed *physicochemical parameters lower than the permissible limits and sulphate, iron, magnese, zinc and lead contents were not found in the water samples.*

Key Words: *Physicochemical characteristics, Ground water quality in Toungoo.*

1. INTRODUCTION:

More than 70% of the earth's surface is covered by water. Water is an essential component of all forms of life; no organism can survive without water. Ground water pollution has become a major subject of public concern the world over. According to WHO about 80% of all the diseases in human being are caused by water (Kavitha and Elangova,2010).

Water is mainly obtained from two sources, that is, surface water which includes rivers, canals, fresh water, lakes, streams, etc, and ground water like well and borehole water (Murry,Fay,2004). Usually the ground water is considered less polluted as compared to the surface water due to less exposure to the external environment (Iqbal and Gupta, 2009). However, the modern civilization, industrialization, urbanization increase in population and improper waste management are agents of degradation of ground water quality (Agarwal, 2009). Ground water is ultimate, most suitable fresh water, resource with nearly balanced concentration of the SaH for human consumption (Tewari, Dubey and Trivedi, 2010).

In Myanmar, most of the population is dependent on ground water as the only source of drinking water supply. The ground water is believed to be comparatively much clean and free from pollution than surface water (Patil, 2010). But prolonged discharge of industrial effluents, domestic source and solid waste dump causes the ground water to become polluted and created health problems (Raja, Sharmila, Merlin and Chritopher, 2002). The ground water pollution is highest in urban areas than rural areas where large volumes of waste concentrated and discharged near to the urban lakes. The increasing demand of water from fast growth of industries has put pressure on limited water resources (Ramesh and Soorya, 2012).

To communicate information on the quality of water to the concerned citizens and policy makers, analysis of water is almost important. It thus, becomes on important factor for the assessment and management of ground water. Thus, in this research work an attempt has been made to assess the physical and chemical parameters of ground water.

Ground water is a good source of fresh water resource which is the biggest issues in front of the policy makers for its substainable Utilization Natural filtration through soil and sediments makes the ground water free from organic impurities (Karanth, 1989).

2. METHODOLOGY:

Water Sample Collection Area

During the study, ground water samples Toungoo have been chosen. Since it is simply a model of rural area and residential area concerning with the water environment. Water collected from three different points, depth ranging from 300 ft to 200 ft, 200 ft to 150 ft and 150 ft to 100 ft. After collecting, water samples from chosen points were studied for their quality. A total of three water samples were collected for analysis in the period of the raining season in Myanmar.

The samples were collected in white plastic containers. Sample containers were used only for water samples and never for the storage of chemical or other liquids. Storage time was kept to a minimum under appropriate conditions. As the water was sample from the tube well. Ground water samples were collected in plastic bottle of 1 litre capacity for physicochemical analysis. Bottles were properly washed and rinsed thoroughly with distilled water and then ground water of each sampling site.

3. RESULTS AND DISCUSSION:

The physiochemical characteristics of the water samples were tabulated of below.

pH

In this research work, the pH of water was determined by Electrometric Method, pH meter (F-51 HORIBA). The pH is the measure of acidity or alkalinity of water. Value range of pH from 7 to 14 is alkaline, from 0 to 7 is acidic and 7 is neutral. The pH values of study areas are within the permissible limits of WHO standards 6.5 to 9.0. The value of pH is found to lie between 6.7 to 7.4(Table .1).The pH of water samples were considered normal for water.

Electrical conductivity

Electrical conductivity reflects the capacity of water to conduct electrical current, and is directly related to the concentration of salts. The concentration of ions in solution, the higher the concentration of ions in solution the higher its conductivity will be.

In this research work, the electrical conductivity values of sample “a” is slightly lower than the permissible limits of WHO and sample “b” and “c” are lower than the permissible limits (Table .1). As determined by Electrometric Method, Conductivity meter (DS-51, HORIBA).

Total Alkalinity

The most natural water bicarbonate and sometime carbonates are present amounts. The carbonates and bicarbonates of calcium, sodium and magnesium are the common impurities that cause alkalinity. Their salts get hydrolysed in solution and produce hydrogen ion, consequently raising the pH (Wing Aung , 1995). The ranges of alkalinity have been found to lie in between 130 ppm to 140 ppm. The standard values as prescribed by the WHO are between 200 ppm to 600 ppm. Therefore, the total alkalinity is found to lie in between the prescribed limits.

In this research work, total alkalinity of water samples from sample “a” was 140 ppm. It was found that sample “a” had slightly higher alkalinity content compared to sample to sample “b” and sample “c” in this work. It may be probably due to the fact that the sample “a” has higher inorganic matter than that of sample“b” and“c”(Table.1). As determined by EDTA Titrimetrimetric Method.

Total Hardness

The hardness of water varies considerably from place to place. In general, surface water are softener than ground water. The effect of hardness is scale in utensils and hot water system in boiler etc. The treatment if hard water is softener Ion Exchanger and Reverse Osmosis process. The degree of hardness of drinking water has been classified in terms of the equivalent CaCO3 concentration as follows: soft 0-60 mg/L, medium 60-120 mg/L, hard 120-180 mg/L, very hard >180 mg/L.

In this research work, hardness of water varies from 60.65 ppm to 70.22 ppm (Table .1). So that, it may be regarded as medium soft water. The value of total hardness for the sample “a” was the highest and that of “c” was the lowest, the total hardness is the sample “b” is the second lowest. As determined by EDTA Titrimetrimetric Method.

Calcium

Calcium is a chemical element that is essential for living organisms, including humans. Around 99 % of the calcium in the human body is found in the bones and teeth, it is essential for the development growth, and maintenance of bone. High content of calcium and magnesium in drinking water should be avoided in the cause of kidney stone or bladder stone.

In this study, calcium content of water sample “a” was 9.7 ppm, sample “b” was 5.9 ppm and sample “c” was 5.5 ppm. In short, the water samples of calcium content were found to be lower than the permissible limit of WHO (Table .1). As determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400.

Magnesium

Magnesium is a mineral that your body needs to function properly. Many people are deficient in this essential nutrient, which is found in food like nuts, leaf greens, legumes, and seeds. Smaller amounts are found in meat and fish. Due to deficiency of magnesium various risks to humans increases such as hypertension, cardiac, eclampsia in pregnant women etc.

In this study, magnesium content of water sample "a", "b", and "c" were found to be 1.3 ppm, 1.2 ppm and 1.1 ppm respectively. The water samples of magnesium content were found to be lower than the permissible limits of WHO (Table .1). As determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400.

Sodium

Sodium is a common element in the natural environment and is often found in food and drinking water. The human body needs sodium in order to maintain blood pressure control fluid levels and for normal nerve and muscle function. Sodium in drinking water is not healthy concern for most people but may be for someone with specific health issues that require them to be on a sodium restricted diet.

In this study, sodium content of water sample "a", "b", and "c" were found to be 5.6 ppm, 11.2 ppm and 11.0 ppm respectively. The water samples of sodium contents were found to be lower than the permissible limits of WHO (Table .1).As determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400.

Potassium

Roughly 98% of the potassium in your body is found in your cells of this, 80% is found in your muscle cells, while the other 20% can be found in your bones, liver and red blood cells. Potassium levels have a significant effect on muscle contractions. Altered levels can cause muscle weakness, and in the heart, they may cause an irregular heartbeat.

In this study, potassium content was determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400. Potassium content of water sample "a", "b", and "c" were found to be 3.2 ppm, 3.0 ppm and 2.9 ppm respectively (Table .1). It was observed that the trend of the potassium contents was not obviously greater between the three types of water samples studied. In this investigation the contents of potassium in the water samples studied were lower than the permissible limit.

Carbonate

In this study area, there is no carbonate concentration (Table .1), was determined by Titrimetric method.

Bicarbonate

In this investigation, bicarbonate content was determined by Titrimetric Method. All water samples from the tube well containing bicarbonate concentration are generally in the range of 61.0 ppm to 53.8 ppm (Table .1).

Chloride

All types of natural and raw water contains chlorides. The main form in which chloride is found in the ground water is sodium chloride. Soil porosity and permeability plays a major role in building up of the chloride concentration.

In this study, chloride content of water sample "a", "b", and "c" were found to be 90.5 ppm, 93.8 ppm and 94.5 ppm respectively (Table .1). It is found to be lower than the standard prescribed limits. As determined by Titrimetric Method.

Sulphate

Sulphates are inorganic ions that are both found in nature and synthesized for industry. Natural water contains sulphate ions and most of these ions are also soluble in water. Many sulphate ions are produced by oxidation process of their ores, they also present in industrial wastes.

In this study, concentration of sulphate is found to be absent in these water samples (Table .1), as determined by Tubidimetric Method, UV-VIS Spectrophotometer, Janway 6305.

Iron

Iron is essential to almost living things, from micro-organisms to humans. A more common problem for humans is iron deficiency, which leads to anaemia. A man needs an average daily intake 7 mg of iron and a woman 11 mg, a normal diet will generally provide all that is needed.

In this study, iron content was found to be absent in these water samples (Table .1), as determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400. The assessment on the water quality has proved that drinking or using for household needs provides tremendous health benefits.

Lead

Many common lead salts, such as the carbonate, hydroxide, and sulphite are extremely insoluble in water, this usually limits the dissolved lead content in a body water (Barley, *et al*, 1978). The toxicity of lead in the environment has caught extensive concern in recent years.

In this study, lead content was found to be absent in these water samples (Table .1), as determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400.

Manganese

Humans enhance manganese concentrations in the air by industrial activities and through burning fossil fuels. Manganese that derives from human sources can also enter surface water, ground water and swage water.

In this study, manganese content was determined by the Spectrophotometric Method (Atomic Absorption Spectrophotometer Nov AA 400). The manganese content was found to be absent in these water samples (Table .1).

Zinc

Zinc is an important aspect of nutrition and a trace element that is necessary for a healthy immune system. A lack of zinc can make a person more susceptible to disease and illness. During pregnancy and lacatation, women may need extra zinc. Deficiency in children can lead to growth impediments and increased risk of infection.

In this study, zinc content was found to be absent in these water samples (Table .1), as determined by spectrophotometric Method, Atomic Absorption Spectrophotometer Nov AA 400.

(Table .1) Results of the Physicochemical Characteristics of Ground water in Toungoo.

Sr. No	Characteristics	Unit	WHO	Samples		
				Depth ranging from 300ft-200ft	Depth ranging from 200ft-150ft	Depth ranging from 150ft-100ft
				a	b	c
1.	pH	-	6.5-9	7.4	6.9	6.7
2.	EC	dsm-1	0.25-0.75	0.24	0.17	0.15
3.	Total Hardness	ppm	>200	70.22	65.75	60-65
4.	Total Alkalinity	ppm	200	140	135	130
5.	Ca	ppm	75-200	9.7	5.9	5.5
6.	Mg	ppm	30-150	1.3	1.2	1.1
7.	Na	ppm	200	5.6	11.2	11.0
8.	K	ppm	20	3.2	3.0	2.9
9.	CO3	ppm	350	Nil	Nil	Nil
10.	HCO3	ppm	1000	61.0	54.9	53.8
11.	CL	ppm	200	90.5	93.8	94.5
12.	SO4	ppm	200-400	Nil	Nil	Nil
13.	Fe	ppm	0.1-0.3	Nil	Nil	Nil
14.	Mn	ppm	0.05	Nil	Nil	Nil
15.	Zn	ppm	5-10	Nil	Nil	Nil
16.	Pb	ppm	-	Nil	Nil	Nil

4. CONCLUSION:

Water quality is dependent on the type of pollutant added and the nature of mineral found at particular zone of tube well. Monitoring of the water quality of ground water is done by collecting representative water samples and analysis of physiochemical characteristics of water samples at different locations. Drinking water reserves, because of

their importance to public health, are collective concern. It is everyone's duty to ensure that they are properly safeguarded and protected. The main causes to pollute the ground water are solid waste disposal, domestic and industrial sewage drainage, in order to avoid possible water contamination we have to treat them.

The above study which was carried out from (raining season) clearly shows that all the parameters which were analyzed showed permissible amount of concentration. Since there is no influx of sewage water, the water shows concentration of various salts below the average level which is extremely important factor and the water can be used for drinking purpose by boiling and filtrations

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