



Physico Chemical Assessment of Bore Water in Muthupet Areas of Thiruvarur District, Tamil Nadu, India

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ABSTRACT

Water is the major source for the survival of living things. Due to increased human activities, contaminates in the water can affect the water quality. In turn, this can lead to public health problems. The causes of water pollution include a wide range of chemicals and pathogens as well as physical parameters. The Physico chemical characteristics of water vary depending on the source and human activities. The Immediate Sea near the shore gets pollute to a variety of activities along the coast. The people must be educated to know the problem arising due to water pollution. Hence the present study investigates the Physico chemical characteristics of bore water in Muthupet Areas. Samples of bore water were collected and analyzed. The result was compared with standards and provides valuable suggestion and recommendation for water management.

Keyword: Environment, Water pollution, Physico chemical parameters, water quality

INTRODUCTION

Ground water is water located below the ground surface. Ground water starts as rain and flows underground for long periods of time through aquifers. People drink ground water with water wells. They drill wells deep below the surface. Then in the aquifer, the ground water stored inside will be pumped up and used. In many parts of the world today ground water is the only source of fresh water [13]. Ground water is said to be the safest water for drinking and domestic purposes [8].

By the enormous and rapid growth of various industries, it is fled that several environment, water pollution has been result in by introduction of extraneous matter in solid, liquid or gaseous forms

which leads to hazardous to the society. Pollution from land based activities includes spilling from sewage effluents from a variety of industries. Most of the rivers which discharge large quantities of water in to the coastal marine environment has long been used as a site for the disposal of waste. The coastal areas are affected by the discharge of sewage generated by the habitations located nearby also.

Providing clean and safe water is the major challenge with the increasing industrialization and globalization [16]. An understanding of water chemistry is the bases of the knowledge of multi dimensional aspect of aquatic environment chemistry. The quality of water is of vital concern for the mankind [12]. Water quality refers to the chemical, physical and biological and radiological characteristics of water. It is most frequently used by reference to a set of standards against which compliance, generally achieved through treatments of water, can be assessed.

Various treatment methods are adopted to raise the quality of drinking water [11] water is the most critical resource of our life. According to W H O “access to safe drinking water is essential to health, a basic human right and a component of effective policy for health protection”. Hence it is required to analyze the water before using it.

EXPERIMENTAL METHODS

Sampling Technique

The samples were collected in a previously washed and dried high grade plastic containers from the bore wells of different areas. After filling the container before it was closed, recorded the sample temperature by using mobile thermometer and it was closed immediately. Then the samples were preserved to

resist the changes that may occur before analysis. The samples were collected during the month of January 2018.

Physic chemical analysis

The samples collected were analyzed for important parameters such as p^H , Electrical conductivity, The Total dissolved solids, Total hardness, Chloride, Sulfate, and Alkalinity. p^H and Conductivity was directly determined by using digital p^H meter and conductivity meter. Titrimetric method was used for the determination of alkalinity and gravimetric method for Total dissolved solid and Total suspended solids. Chloride was estimated by Mohr's method. Sulfate was estimated using Gravimetric method. Total hardness was determined by EDTA titrimetric method.

Table: 1 Selected Sampling Stations

Sample No	Name of the stations
1	Thillaivizagam
2	Caviler
3	Muthupet
4	Palaver
5	Sithamalli
6	Melanammangkurichi
7	Upper
8	Karaiyankadu
9	Sembadavankadu
10	Aalangadu

Table: 2 Drinking water standards

S. No	Parameters	BIS (10500;2012)		WHO	
		Desirable (ppm)	Maximum Permissible (ppm)	Desirable (ppm)	Maximum Permissible (ppm)
1	p^H	6.5-8.5	6.5-9.2	7-8.5	6.5-9.2
2	TDS	500	2000	-	-
3	Total hardness	200	600	300	600
4	Calcium	75	200	75	200
5	Magnesium	30	100	50	150
6	Sulfate	200	400	200	400
7	Total Alkalinity	200	600	300	600
8	Chloride	250	1000	250	1000

Table: 3 Drinking water standard (EPA)

S. No	Parameters	United State – Environmental Protection Agency (ppm)
1	p^H	6.0-8.5
2	TS	550
3	TDS	500
4	TSS	50
3	Total hardness	300
4	Calcium	200
5	Magnesium	100
6	Chloride	250
7	Sulfate	250
8	Alkalinity	33
9	Dissolved CO_2	Less or more than 10

Table: 4 Physical Characteristics

Sample No	Color	Odor	p ^H	Electrical Conductivity (m. mhos)
1	Colorless	Colorless	8.15	0.20
2	Colorless	Colorless	7.13	0.92
3	Colorless	Colorless	8.15	0.21
4	Colorless	Colorless	7.801	1.18
5	Colorless	Colorless	8.42	0.33
6	Colorless	Colorless	8.26	0.22
7	Colorless	Colorless	7.53	1.22
8	Colorless	Colorless	7.80	0.25
9	Colorless	Colorless	6.93	2.16
10	Colorless	Colorless	8.75	0.33

Table: 5 Chemical Characteristics

Parameters (ppm)	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
TS	370	800	550	337	500	255	158	337	304	220
TDS	970	451	100	413	940	760	101	713	137	770
TSS	570	349	450	378	30	535	57	378	167	990
Total hardness	324	512	403	280	260	225	217	280	628	512
Calcium	61	199	59	51	69	40	89	57	170	261
Magnesium	241	313	344	229	201	185	128	229	458	464
Chloride	298	7804	402	167	173	1209	202	1017	574	184
Sulfate	565	302	808	120	164	315	606	242	506	256
Dissolved CO ₂	86	246	104	172	72	102	242	172	735	107
Alkalinity	197	487	208	580	201	399	353	580	479	641

RESULTS AND DISCUSSION

In order to assess the water quality of some locations, need to be analyzed the various Physico -Chemical parameters. However certain parameters are of special importance and deserve frequent attention. These results were compared with standard specifications such as BIS, WHO, US-EPA.

p^H

In the present study p^H recorded in the range from 6.93 to 8.75. but desirable limit is up to 8.5 in all standards. For all samples values were in permissible limit according to all standards except sample 10 indicating slightly alkaline nature.

Electrical conductivity

It is actually measure of the ionic activity of a solution. The amount and natures of many dissolved

substances influence their ability to electrical conductance [13]. Electrical conductivity value ranged from 0.20 to 1.22 memos. EC is the most important parameter to determine salinity hazard and fitness for ground water for agriculture purpose. Absolute pure water is a poor conductor of electricity. All water samples showed higher conductivity values.

Total dissolved and Total suspended solids

It indicates the salinity of water. Electrical conductivity and Total dissolved solids are interrelated. For the samples 1, 5, 6, 8, and 10 TDS values were higher than in all standards. TSS values of all samples were higher than EPA. TDS value above the permissible limit causes gastro intestinal irritation.

Total hardness

Hardness is due to the presence of Calcium, Magnesium, Chloride and sulfate ions. The maximum desirable limit is 300-600 ppm (WHO). Total hardness of 4, 5, 6, 7, and 8 sample values were in the permissible limit. Sample 1, 2, 3, and 10 were within the maximum desirable limit. Sample 9 values were higher than all Standards. Hardness leads to skin irritation and poor lathering with soap.

Sulfate

Sulfate can be found in almost all natural water. It is one of the major dissolved components of rain. High concentration of sulfate in us can have laxative effect. Sulfate gives a bitter or medicinal taste to water. High concentration of sulfate can experience a Dehydration and Diarrhea. Sulfate values of sample 2, 4, 5, 6, 8 and 10 values were near in the permissible limit according to all standards. Sample 1, 3, 7, 9 sulfate value were higher in all standards.

Chloride

Chloride is an essential electrolyte located in all body fluids responsible for maintaining acid/base balance, transmitting nerve impulses and regulating fluid in and out of cells. Although chlorides are harmless at low level. EPA recommends no higher than 250 ppm. At level greater than this sodium chloride can complicate existing heart problems and contribute high blood pressure when ingested in excess. Sample 2, 6, 8 chloride values were higher than in EPA Standard.

Dissolved Carbon dioxide

Natural water contains Dissolved Carbon dioxide. The Dissolved Carbon dioxide is often contributor to the acidity leads to corrosion. In the present study, The Dissolved CO₂ of all samples was higher than all Standards.

CONCLUSION

The Physico Chemical assessment of bore water samples in selected Muthupet areas of Thiruvavur District Tamil Nadu, investigated results shows that sample 2, 4, 5, and 7 only were used for drinking purpose. Sample 1, 3, 6, 8, 9 and 10 was not used for drinking purpose. This study was to provide information useful for necessary pre treatment methods such as Reverse Osmosis, Distillation and Deionization by Ion exchange be used before using the water from bore well for Human Consumption.

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