Indian J.Sci.Res. 9 (1): 154-157, 2014
DOI: 10.5958/2250-0138.2014.00024.8
ISSN: 0976-2876 (Print)
ISSN: 2250-0138(Online)

ANALYSIS OF PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER

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ABSTRACT

Water is a chemical compound with the chemical formula H_2O. Water molecule contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is a liquid at standard ambient temperature and pressure, but it often co-exists on Earth with its solid state, ice, and gaseous state. Ground water pollution is a type of pollution which occurs when ground water becomes contaminated. Water have many Physical and Chemical characteristics like pH, Temperature, Alkalinity, Acidity, Hardness, Chorine, Phosphate, Nitrate, Nitrite, Arsenic and Fluoride There are several processes to measure to Physico-chemical characteristics like Titrimetric method, Spectrophotomitric method etc.

KEYWORDS: - Ground water, Physico-chemical parameter, Contaminated, Spectrophotomitric method

Water is one of the most important substances on earth. All plants and animals must have water to survive. If there was no water there would be no life on earth. Water is also essential for the healthy growth of farm crops and farm stock and is used in the manufacture of many products. Around the world, groundwater pollution is a very serious and costly problem, and many governments have started to take aggressive action to address it. Once contaminated, groundwater is very expensive to clean up and make usable again, and in some cases, an aquifer may be so contaminated that it has to be abandoned, which can put tremendous pressure on a community as it attempts to find a new supply of water. There are several different types of groundwater, ranging from water which flows freely through the ground and interacts with surface water to closed aquifers, which are theoretically very hard to contaminate. Groundwater becomes polluted when materials seep through the soil and reach the water, which can happen when rainfall washes contaminants into the ground, when polluted surface water connects with groundwater, and when buried tanks or waste disposal sites start to leach.

We all know that water is the life's matter and matrix and without it life cannot exist. It gives us the evolution and functions of universe on the Earth hence water is "Mother of all living world". Majority of water available on the earth is saline in the nature; only small quality exists as fresh water. Fresh water has become a scare commode due to over exploitation and pollution (Ghosh et al., 1968; Gupta et al., 2006; Patil and Tijare, 2001; Singh and Mathur, 2005). Industrial, sewage and municipal wastes are being continuously added to water reservoirs affect physiochemical quality of water making them unfit for use of livestock and other organisms (Diwedi and Pandey, 2002; Chaurasia and Pandey, 2007).

In recent years, an increasing threat to ground water quality due to human activities has become of great importance. The adverse effects on ground water quality are the results of man's activity at ground surface, unintentionally by agriculture, domestic and industrial effluents, unexpectedly by sub-surface or surface disposal of sewage and industrial wastes. The quality of ground water is of great importance in determining the suitability of particular ground water for a certain use (public water supply, irrigation, industrial applications, power generation etc.). The quality of ground water is the resultant of all the processes and reactions that have acted on the water from the moment it condensed in the atmosphere to the time it is discharged by a well. Therefore, the quality of ground water varies from place to place, with the depth of water table, and from season to season and is primarily governed by the extent and composition of dissolved solids present in it.

A vast majority of ground water quality problems are caused by contamination, over- exploitation, or combination of the two. Most ground water quality problems are difficult to detect and hard to resolve. The wide range of contamination sources is one of the many factors contributing to the complexity of groundwater assessment (Sawant and Telave, 2009). It is important to know the geochemistry of the chemical-soil-groundwater interactions in order to assess the fate and impact of pollutant discharged on to the ground. Pollutants move through several different hydrologic zones as they migrate through the soil to the water table.

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A major problem in urbanized areas is the collection and disposal of domestic wastes (Kolade, 1982). Because a large volume of sewage is generated in a small area, the waste cannot be adequately disposed off by conventional septic tanks and cesspools. The intensive use of natural resources and the large production of wastes in modern society often pose a threat to ground water quality and have already resulted in many incidents of ground water contamination (Chakraborty, et al, 1959; Rao, et al., 1999). Pollutants are being added to the ground water system through human activities and natural processes. Solid waste from industrial units is being dumped near the factories, which is subjected to reaction with percolating rain water and reaches the ground water level. The percolating water picks up a large amount of dissolved constituents and reaches the aquifer system and contaminates the ground water.

Water from most sources is therefore unfit for immediate consumption without some sort of treatment (Raymond, 1992). The consequences of waterborne bacteria and virus infection; polio, hepatitis, cholera, typhoid, diarrhea, stomach cramps, etc, have been well established but nitrate contamination is just as deadly. Consequent to the realization of the potential health hazards that may result from contaminated drinking water, contamination of drinking water from any source is therefore of primary importance because of the danger and risk of water borne diseases (Edema et al., 2001; Fapetu, 2000). Thus, regular physico-chemical analysis of water at source must be carried out to determine or check the effectiveness of treatment process (Okonko et al., 2008).

In village schools the ground water is provided to the children it is may be polluted. This work will be an attempt to examine the different parameters of sources of water and will compare with standard table of potability of water. In proposed project the physico chemical study and microbial flora of ground water will be done to assure the potability of water.

MATERIALS & METHOD

Study area

The study area is Nalgonda district, Andhra Pradesh, India. In this district so many villagers are affected by the high Fluoride content in water. In this area ground water is only source for drinking and irrigation purpose.

Collection of water samples

Samples were collected from the hand pumps, bore wells used for domestic or irrigation purpose from the Nalgonda district of Andhra Pradesh, India.

Determination of Phosphate

Into a series of 100ml of standard flask, added phosphate working solution, from 1 to 10ml in each flask. Added 4.0ml of ammonium molybdate and 0.5ml of $SnCl_2$.Then added distilled water to mark of standard flask. Optical Density was taken at 690nm.

Determination of Nitrate Nitrogen (No_3^{2-})

Into a series of 100ml of standard flask add Nitrate working solution, up to 1ml in each flask. Added 1ml of Brucine sulfanilic acid and 10ml of prepared diluted H_2SO_4, and kept in dark for 10 minutes. This was followed by addition of 30ml distilled and kept again in dark for 30 minutes. Then added distilled water to mark of standard flask and ptical Density was taken at 410nm.

Determination of Nitrite Nitrogen (No_2^-)

Into a series of 100ml of standard flask add Nitrite working solution, up to 1ml in each flask. Then, addition of 4ml NaOh is followed by addition of 2ml sulfanilamide, 0.2ml of H_2O_2 & NEDA each.

Determination of Sulfate

Into a series of 50ml of standard flasks, water samples were taken in amount from 01 to 05ml.Added 10ml of Absorbing solution to each flask. Then, addition of 1ml Formaldehyde is followed by addition of 1ml water samples (taken in 50ml standard flasks), 1ml of Para Rosaline HCl each. Kept in room temperature for 15 minutes.

Determination of Chloride

10ml of water sample was taken, added 1ml of K_2CrO_4 (an indicator) then solution turned in yellow. Titrated against $AgNO_3$.Red-Brown colour is appeared in solution or white precipitation is found due to the presence of chloride.

Determination of Alkalinity

10ml of sample was taken into a flask.1drop of sodium thiosulfate was added, and then added two drops of phenolphthalein indicator. The solution was titrated against sulfuric acid till the colour just disappeared, did pen-down the reading. Then addition of two drops of methyl orange was done. Again titrated against sulfuric acid until the color turns orange yellow, noted the readings.

Determination of Acidity

10ml of sample was taken into a flask.1ml of Ammonia buffer solution was added. Then addition of two drops of Eriochrome black T indicator was done until solution turned to wine red colour. The solution was then titrated against 0.01M standard EDTA solution with continuous stirring until the last reddish tinge disappeared from the solution.

Determination of Arsenic

Into a series of 100ml of standard flask add arsenic working solution, up to 1ml in each flask. To each flask add 4.0ml of ammonium molybdate and 0.5ml of $SnCl_2$.Then added distilled water to mark of standard flask.

Determination of Fluoride

Into a series of 25ml of standard flask added fluoride working solution, up to 1ml in each flask. To each flask addition of 5ml of SPADNS reagent was done. Then added distilled water to mark of standard flask.

	Samples Collected from and Source of water samples						
SN	**Water Quality Parameter**	**Bore well (Yellagiri)**	**Hand pump (Turfanpeta)**	**Tap water (Turfanpeta)**	**Bore well (Lingojijudan)**	**Hand pump (Khaitapur)**	**WHO range**
1	Temperature (°C)	26.5	26.7	26.8	26.8	26.5	20-25°C
2	pH	7.3	6.9	7.4	7.5	7.1	6.5-8.5
3	ES (mS)	1.65	1.07	0.98	5.97	1.38	0.5Ms
4	TDS (mg/L)	3.3×10-8	3.42×10-6	3.24×10-7	4.935×10-6	1.35×10-7	500-1500mg/L
5	Salinity (%)	0.7	1.2	0.6	4.8	1.0	< 0.05%
6	DO (mg/L)	1.6	1.5	2.6	3.7	3.1	5mg/L
7	Alkalinity (mg/L)	0.087	0.106	0.073	0.053	0.086	> 20mg/L
8	Total Hard. (mg/L)	0.413	0.406	0.267	0.82	0.553	200mg/L
9	Turbidity (NTU)	50	65	65	65	50	5-20NTU
10	Chloride (mg/L)	10.63	9.39	5.84	15.24	8.15	200mg/L
11	Sulphate (mg/L)	0.5	0.7	0.7	0.7	0.7	200mg/L
12	Phosphate (mg/L)	0.053	0.086	0.062	0.090	0.071	5-10mg/L
13	Nitrite (mg/L)	0.003	0.004	0.001	0.005	0.002	50-100 mg/L
14	Nitrate (mg/L)	0.092	0.138	0.071	0.143	0.118	0.5 mg/L
15	Fluoride (mg/L)	0.7	2.1	3.1	3.6	1.5	1.0-1.5mg/L
16	Arsenic(mg/L)	1.0	1.80	1.76	2.0	1.94	0.2mg/L

RESULT & DISCUSSION

Physico-Chemical characteristics of the samples are present in table and the comparison is carried out with the WHO guidelines. In the present study only the temperature, pH and dissolved oxygen of water samples are ranged between or quite close to the range of WHO. The Bore well water from Lingojijudan, have higher values of Total Dissolved Solid, Salinity, Dissolved Oxygen, Total Hardness,. Turbidity, Chloride, Sulphate, Phosphate Fluoride and Arsenic than WHO values.

So the water samples which is collected from Lingojijudan, Nalgonda district, Andhra Pradesh cannot use as drinking water because the required amount of Physico-Chemical parameters are not within the range.

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