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Physicochemical Analysis of Water from Various Sources in Umarkhed Region

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ABSTRACT

Water is perhaps the most precious natural resource after air. Though the surface of the earth is mostly consisting of water, only a small part of it is usable, which makes this resource very limited. This precious and limited resource, therefore, must be used with prudence. As water is required for different purposes, the suitability of it must be checked before use. Also, sources of water must be monitored regularly to determine whether they are in sound health or not. Poor condition of water bodies is not only the indictor of environmental degradation, it is also a threat to the ecosystem. In industries, improper quality of water may cause hazards and severe economic loss. Thus, the quality of water is very important in both environmental and economic aspects. Thus, water quality analysis is essential for using it in any purpose. After years of research, water quality analysis is now consisting of some standard protocols. There are guidelines for sampling, preservation and analysis of the samples. Here the standard chain of action is discussed briefly so that it may be useful to the analysts and researchers. Key Words: Water Quality Monitoring, Water Quality Assessment, Water Quality Analysis, Chain of Custody

Keywords: Drinking water, water quality parameters, underground water.

I. INTRODUCTION

Water is one of the most important natural resources on the earth. Water is important to all living organisms, ecological systems, human health, food production and economic development. Drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems. Due to these contaminants quality of drinking water becomes poor. Sometimes this quality of water causes different type of diseases in the human being , so that quality of water must be tested for both the chemical as well as microbial contaminants. The most important 5 major Application of water are: 1.] Hydropower, 2.] Domestics uses 3.] Irrigation 4.]

Industrial uses 5.] Commercial uses. The most important water quality parameters considered for the examination in this study are pH, Odour, Colour, Taste, Temperature, Turbidity, Total Dissolved Solids (TDS), Dissolved oxygen (DO), Dissolved carbon dioxide, Metals and Metalloids, Total Hardness, Alkalinity etc.

Drinking water is an important constituent for all types of living beings. Groundwater is one of the most valuable natural resources, which supports human health, economic development and ecological diversity. Groundwater is a valuable dynamic and replenishes able natural resource in present day and limited in extent. Groundwater resource assessment of a region involves a detailed study of the sub-surface water, including geology and hydrogeology, monitoring and production of well data. The water quality guidelines provide a Limit Value for each parameter

for drinking water. It is necessary that the quality of drinking water.

2.2Drinking: As per WHO/CPCB Standards Irrigation: pH Conductivity Sodium & Potassium Nutrients Specific compounds

II. MATERIALS AND METHODS

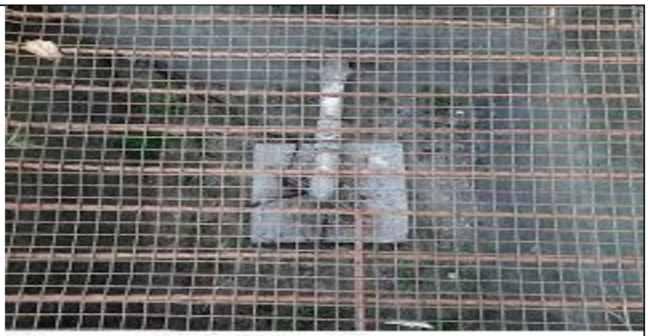
The Water Samples are collected from Umarkhed region in ten Different places in the Morning Hours between 9 to 11am, Water Sample are collected in Polythene Bottles. The Water samples are immediately brought in to Laboratory of G.S Gawande college Umarkhed for the Estimation of various Physico-chemical Parameters like Water Temperature, pH was recorded by using Thermometer and Digital pH Meter. (Systronics). Specific conductivities is measured by using digital conductivity meter. The TDS values were measured by using TDS meter. While other Parameters Such as Hardness, Sodium, and potassium by Flame photometry. The Manganesium, Calcium & Magnesium Chloride, Sulphate and Nitrate were Estimated in the Laboratory By using Standard laboratory methods. In Present Study involves the Analysis of Water Quality in Terms of Physicochemical methods.

2.1. Study Area

The study area has been shown with location latitudes and longitudes with all details as shown in Photograph. The climate of the area is generally mentioned. Surrounding local and geological condition should be mention. I have followed Study area in Umarkhed region at different places.

2.2. Sample Collection

I have collected sample For Drinking water analysis to collect the sample either in plastic bottle or glass bottle. Various water quality parameters required the certain temperature. All parameters should determine using as per standard methods.



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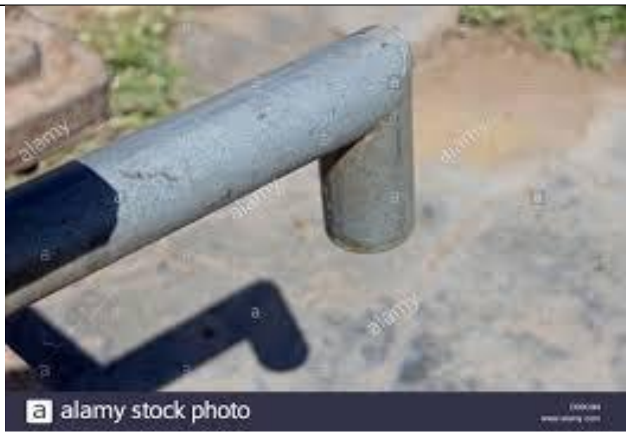
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Table: 1- Details of Sample Sources.

Sample No.	Sample Station	Type of Source	ccc	Latitude N	Longitude E
1.	Chauibhara	Bore Well	66	17^0 716^1	83^0 285^1
2.	Khadakpura	Open Well	28	17^0712^1	83^0 295^1
3.	Nath Nagar	Bore Well	68	17^0 716^1	83^0 289^1
4.	AnandNagri	Open Well	31	17^0 721^1	83^0 286^1
5.	Teacher Colny	Bore Well	61	17^0 722^1	83^0 287^1
6.	Bourbon	Bore Well	70	17^0 725^1	83^0 289^1
7.	Azad Ward	Bore Well	65	17^0 724^1	83^0 285^1
8.	Nagapur	Open Well	32	17^0 719^1	83^0 289^1
9.	Rupala	Open Well	35	17^0 718^1	83^0 283^1
10.	Gawande College	Bore Well	68	17^0 718^1	83^0 287^1

III. ANALYTICAL METHODS

Table: 2- Methods of Analysis:

S.NO.	Parameter	Method	Instrument/Equipment
1.	**Temperature**	Laboratory method	0.1 0 *c* scale thermometer
2.	**P^H**	Electrometric	pH meter
3.	**Conductivity**	Electrometric	Conductivity meter
4.	**DO, BOD**	Iodometric (Titrimetric)	
5.	**COD.**	Chemical oxidation-reduction , open reflux, Closed reflux, COD Disaster	
6.	**Hardness, Ca**	Titration with EDTA	Titrimetric Method (Complexometric).
7.	**Alkalinity**	Titration with Sulphuric acid	Titrimetric Method
8.	**Chloride**	Titration with Silver nitrate	Titrimetric Method
9.	**Na, K**	Flame Photometric	Flame photometer
10.	**Nitrate,**	Photometric Method	UV-Vis. Spectrophotometer
11.	**Phosphate**	Photometric Method	UV-Vis. Spectrophotometer
12.	**Boron**	Photometric Method	Photometer WTW, model Photoflex Turb Set
13.	**Floride**	Photometric Method	Photometer WTW, model Photoflex Turb Set

3.1. Analysis of Samples:

Analysis of the collected ground water samples was done in accordance with the procedures suggested in the Standard Analytical Procedure Manual for water samples which is based on 'Standard Methods for the Examination of Water and Wastewater' 19th edition, APHA, AWWA, wef 1995 (alkalinity-titrimetrically, pH-potentiometrically, HCO3 — + CO3 2- -calculation from pH and alkalinity, DO Iodometrically, BOD- bottle incubation for 5days at 20oC, COD-open reflux, Ca and total hardness-EDTA titrimetric, Mg- calculation from total hardness and Ca, NO3 -&PO4 3—spectrophotometric, Cl—-argentometric titrimetric, total dissolved solids- calculation from conductivity).

Sr. No.	Test	S1	S 2	S 4	S 5	S 6	S 7	S 8	S9	S10
1.	Temperature (ºC)	27	30	28	29	30	27	30	27	29
2.	Colour (Unit)	<1	<1	<1	<1	<1	<1	<1	<1	<1
3.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5.	pH	6.5	7.1	7.3	6.9	7.1	6.8	7.1	6.7	6.8
6.	Turbidity (NTU)	0.6	0.4	0.2	0.3	0.7	0.5	0.5	0.7	0.6
7.	TDS (ppm)	156	150	154	152	153	164	153	152	162
8.	Dissolved oxygen (ppm)	6.1	6.3	6.2	6.2	6.1	6.3	6.1	6.2	6.3
9.	Dissolved carbon dioxide(ppm)	36	40	39	36	38	37	38	36	36
10.	Alkalinity (ppm)	8	9	8	9	10	8	8	10	9
11.	Chloride (ppm)	58	30	41	35	36	40	39	40	37
12.	Calcium (ppm)	7	6.2	8	7.1	6.5	8	6.2	8	6.3
13.	Barium (ppm)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
14.	Magnesium (ppm)	2.2	3.4	2.5	3.1	2.5	2.1	2.1	2.2	2.5
15.	Total Hardness (ppm)	4	4.5	5.0	4.2	3.9	4.1	3.9	4.1	4.0
16.	Copper (ppm)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
17.	Sulphate (ppm)	8	10	14	16	11	9	10	11	9

3.2. Parameters included in water quality assessment Results and Discussion

3.3. Odor, colour and Test

Sample colour is transparent. Organic or suspending partical is not present. Sample is odourless. After color and odor test of sample should be acceptable.

3.4. pH

pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity(Gupta et al., 2009). The reduced rate of photosynthetic activity the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH. During the summer month oxygen value is low coincided with high temperature.Various factors bring about changes the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition (Karanth 1987). The pH Value of water indicate hydrogen ion contration . The pH scale is extends from 0(Very acidic) to 14 (very alkaline) with 7 corresponding to exact neutrality at 25°C (P.R.S.Pillai).

3.5. EC (Electrical Conductivity)

Conductivity shows significant correlation with ten parameters such as temperature , pH value , alkalinity , total hardness , calcium , total solids, total dissolved solids , chemical oxygen demand , chloride and iron concentration of water. Navneet Kumar et al (2010) suggested that the underground drinking water quality of study area can be checked effectively by controlling conductivity of water and this may also be applied to water quality management of other study areas. It is measured with the help of EC meter which measures the resistance offered by the water between two platinized electrodes. The instrument is standardized with known values of conductance observed with standard KCl solution.

3.6. Turbidity

The Intensity of light scattered by the sample in specific conditions with intensity of light scattered by standard reference suspension under the same condition. The higher the intensity of scattered light, higher the turbidity (P.R.S.Pillai).

3.7. Total Alkalinity

The alkalinity of water is a measure of its capacity to neutralize acids. It is primarily due to salts of weak acids, although weak or strong base may also contribute. Alkalinity is usually impacted by bicarbonate, carbonate and hydroxide (P.R.S.Pillai).

3.8. Acidity and Alkalinity

The pH of water is less than 7 that water is acitic water. Much acetic water is harmful for human. It is Composed primarily of carbonate (CO_3^{2-}) and bicarbonate (HCO_3^-), alkalinity acts as a stabilizer for pH. Alkalinity, pH and hardness affect the toxicity of many substances in the water. It is determined by simple dil HCl titration in presence of phenolphthalein (Indicator)and methyl orange indicators. Alkalinity in boiler water essentially results from the presence of hydroxyl and carbonate ions. Hydroxyl alkalinity (causticity) in boiler water is necessary to protect the boiler against corrosion. Too high a causticity causes other operating problems, such as foaming. Excessively high causticity levels can result in a type of caustic attack of the boiler called "embrittlement".

3.9. Biochemical Oxygen Demand (BOD)

The BOD is measure of the extent of pollutant in the water body. The untreated discharge of municipal and domestic wastes in water bodies increases the amount of organic content. Therefore the microbes present in water require more amount of oxygen for its degradation (Sumant Kumar et al.). BOD is a measure of organic material contamination in water, specified in mg/L. BOD is the amount of dissolved oxygen required for the biochemical decomposition of organic compounds and the oxidation of certain inorganic materials (e.g., iron, sulfites). Typically the test for BOD is conducted over a five-day period (Milacron Marketing Co.).

3.10. Chemical Oxygen Demand (COD)

Chemical Oxygen Demond (COD) test measures the oxygen demand of biodegradable pollutants and the oxygen demand of non-biodegradable oxidisable pollutants water. COD is a water quality measure used not only to measure the amount of biologically active substances such as bacteria but also biologically inactive organic matter in water (Khuhawari et al.) COD is another measure of organic material contamination in water specified in mg/L. COD is the amount of dissolved oxygen required to cause chemical oxidation of the organic material in water. Both BOD and COD are key indicators of the environmental health of a surface water supply. They are commonly used in waste water treatment but rarely in general water treatment. (Milacron Marketing Co.).

3.11. Total Hardness

Hardness is defined as the concentration of multivalent metallic cations in solution. The Public health Service Standards recommend a max of 500 mg/l of hardness in drinking water (Peavy, Rowe).

3.12. Calcium

Calcium is measured by complexometric titration with standard solution of ETDA using Patton's and Reeder's indicator under the pH conditions of more than 12.0. These conditions are achieved by adding a fixed volume of 4N Sodium Hydroxide. The volume of titrant (EDTA solution) against the known volume of sample gives the concentration of calcium in the sample water.

3.13. Magnesium

Magnesium is measured by complexometric titration with standard solution of EDTA using Eriochrome black T as indicator under the buffer conditions of pH 10.0. The buffer solution is made from Ammonium Chloride and Ammonium Hydroxide. The solution indicatethe pH variations during titration.

3.14. Sodium

Sodium measured with the help of flame photometer. The instrument is standardized with the known concentration of sodium ion (1 to 100 mg/liter). The samples having higher concentration are suitably diluted with distilled water and the dilution factor is applied to the observed values.

3.15. Potassium

Potassium also measured with the help of flame photometer. The instrument is standardized with known concentration of potassium solution, in the range of 1 mg to 5 mg/litre. The sample having higher concentration is suitably diluted with distilled water and the dilution factor is applied to the observed values.

3.16. Chloride

High chloride content in water may be due to the pollution from chloride rich effluent of sewage and municipal waste. However chloride in excess imparts salty taste to water and people who are not accustomed to high chloride are subjected to laxative effect (Raviprakash ,Rao et al.).

3.17. Sulphate:

Natural water contains sulphate ions and most of these ions are also soluble in water. Many sulphate ions are produce by oxidation process of their ores, they also present in industrial wastes. The method to measure quantity of sulphate is by UV Spectrophotometer. As per IS: 10500-2012 Desirable limit for Sulphate is 200 and 400 mg/l in Permissible limit.

3.18. Nitrate:

Nitrate is present in raw water and mainly it is a form of N2 compound (of its oxidizing state). Nitrate is produced from chemical and fertilizer factories, matters of animals, decline vegetables, domestic and industrial discharge. The method to measure quantity of nitrate is by UV Spectrophotometer. As per IS: 10500-2012 Desirable limit for nitrate is max.45 and no relaxation in permissible limit.

3.19. Chloride16:

All type of natural and raw water contains chlorides. It comes from activities carried out in agricultural area, Industrial activities and from chloride stones. Its concentration is high because of human activities. As per IS: 10500-2012 Desirable limit for chloride is 250 and 1000 mg/l in Permissible limit.

3.20. Fluoride:

Fluoride occurs as fluorspar (fluorite), rock phosphate, triphite, phosphorite crystals etc, in nature. Among factors which control the concentration of fluoride are the climate of the area and the presence of accessory minerals in the rock minerals assemblage through which the ground water is circulating. As per IS: 10500-2012 Desirable limit for fluoride is 1 and 1.5 mg/l in Permissible limit.

3.21. Boron:

Boron naturally occurs as boric acid and boric acid salts. It is released from rocks and soils through weathering, and subsequently ends up in water. It also gets added to soil and ground water through domestic landfills, when these are inadequately sealed .It serves as a typical indicator compound that indicates the presence of other hazardous substances. As per IS: 10500-2012 Desirable limit for Boron is .5 and 1 mg/l in Permissible limit.

3.22. Phosphate:

Phosphorus is an essential plant nutrient and most often controls aquatic plant growth in fresh water. Normally ground water contains only a minimum phosphorus level because of the low solubility of native phosphate minerals and the ability of soils to retain phosphate.

IV. CONCLUSIONS

It is very essential and important to test the water before it is used for drinking,water must be tested with different physic-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we going to use that water and what extent we need its quality and purity. Water does content different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. Groundwater is the most important source of water supply for drinking, irrigation and industrial purposes. Increasing population and its necessities have lead to the deterioration of surface and sub surface water. The modern civilization and urbanization frequently discharging industrial effluent, domestic sewage and solid waste dump. The cause of ground water gets pollute and create health problems. Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source it therefore becomes imperative to regularly monitor the quality of groundwater and to device ways and means to protect it. So before using of water we should investigate qualitative analysis of some physicochemical parameters of groundwater. This may be considered as reference for the society to get cautious about the impending deterioration of their environment and health.

Discussion:

Physical parameters like Temperature, Odour, Taste &Colour was agreeable in Process and Municipal water. The general ISI standard for Drinking water's Turbidity is <0.1 NTU. Turbidity >5 NTU is considered unhealthy. In different area of Municipal water the turbidity ranging from 0.1 NTU to 0.5 NTU. In Naroda Municipal water, observed higher Turbidity than other area. The pH range of drinking water should far between 6.5 to 7.5 and municipal water pH observed 7 to 7.5.So it complied with the acceptance criteria of pH range & it was found to be healthy for human use. For Potable water, Dissolved carbon dioxide & Dissolved oxygen were found to be 6.4 and 33 (Average value of five different areas) respectively. TDS of water sample showed range below 1500 ppm & it complied with the given criteria of Indian standard. Minerals like Calcium, Magnesium, Chloride, Sulphate, Barium, and Copper are essential for body. Tests of theseminerals were performed on potable water sample. The results complied with the given range of Test for Minerals. Alkalinity & Total Hardness of potable water should less than or equal to 10 and 300 ppm respectively. Results were complied with the given limits of both tests. Watertemperature may be depending on the season, geographic location and sampling time. As water Temperature increases, it makes it more difficult for aquatic life to get sufficient oxygen to meet it's need. Thermal pollution can cause shifts in the community structure of aquatic organisms.

Turbidity of lake ranges from 4 NTU to 11 NTU. Some are naturally highly turbid but human activities have increased the levels of suspended solids in many habitats.The lake amount of Total dissolved solid recorded ranges from 668 ppm to 942 ppm. High value of suspended solid can lower the primary Productivity of system by covering the algae and Macrophytes, at times leading to almost their complete removal.The low oxygen level was recorded during summer mainly due to removal of free oxygen through respiration by bacteria and other animals as well as the oxygen demand for decomposition of organic matter. DO is the single most important gas for most aquatic organism.If the amount of free oxygen go below then 2.0 mg/l for few day in the lake containing aquatic organism it would lead the killing of most of the biota in the aquatic system. Higher value of free carbon dioxide generally coincided with minimum dissolved oxygen. Habited water is generally used by animals & birds & aquatic life. The disturbance in this biological system & ecological system may affect health of animals & birds & aquatic life.

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