Researchof Water Quality and its Chemical Parameters by Titration Method and Instrumenal Method

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Abstract—The water quality analysis is an important aspect in understanding the behavior of water and what can they be used for. This study gives us a valuable information on the general properties of water quality parameters like pH, electrical conductivity, TDS, Bicarbonate, Sulfate, Nitrate, chloride etc. of the study area . Water samples were analyzed at the water quality lab. NIH, Roorkee for pH, electrical conductivity and total dissolved solids. The pH of water varied from 7.14 to 7.75. The electrical conductivity (EC) of sample falls from 620µS/cm to 2000µS/cm. The overall total dissolved solids in water of study area varied from 120mg/l to 900mg/l. Overall the range of the Chloride in water of the study area tend to falls between 13mg/l to 375mg/l. Sulfate of all the water samples that were collected from the study area have ranged from 28mg/l to 250mg .The range of the Bicarbonate of all the water samples varied from 320mg/l to 1051mg/l. The study area helps to know about water quality parameters and how to find their values by usingtwo methods : 1) titration method 2) instrumental method .It also helps us to apply these water quality parameters in ArcGis. It helps us to show the values of different parameters in different blocks ofambala for different years In this we have studied different blocks of ambala district Haryana .We have taken the samples from different places from the blocks and also samples are from wells, canal , rivers, ponds.

1. INTRODUCTION

India is blessed with a rich and vast diversity of natural resources, water being one of them. Water is Mother Earth's most wonderful, abundant and useful compound. Water is rated to be of the greatest importance. Water is not only essential for the lives of animals and plants, but also occupies a unique position in industries. Groundwater is an important source of water supply throughout the world. Groundwater occurs almost everywhere beneath the earth surface not in a single widespread aquifer but in thousands of local aquifer systems and compartments that have similar characters. The demand for water has increased over the years, which has led to the water scarcity in many parts of the country. The situation is further aggravated by the problem of water pollution or contamination.The need of integrating utility of such studies creating a visual scenario of the multiple parameters for planners and decision makers. Thus GIS can be used as decision making tools for sustainable management of agriculture land[2]. Changes in the spatial interpretation of the groundwater parameters indicated that the quality and geochemical characteristics of groundwater had a close correlation with topography, geology and hydrograph of Marand plain. Samples which have been obtained from southern parts of the region (near to aquifer recharge center) showed very suitable quality, but the composition of the groundwater changes in the northeast because of an increase of ionic constituents and the existence of fine grain sediments in aquifer zones[3].The temporal assessment of water quality was done by combination of factor analysis and statistical tests. Amol-Babol plain located in the north of Iran where groundwater samples were collected at 154 sampling wells during wet and dry seasons. A results of factor analysis is indicated that first four factors in each season showed similar high factor loading parameters includes: EC, TDS, salinity, Na+, Cl-, Mg2+, Ca2+, CaCO3, MgCO3, total and fecal coliforms[4].

1.1 IMPORTANCE OF WATER AVAILABILITY AND QUALITY

Water is a clear liquid that has no color, taste or smell and have its own chemistry that has fall from cloud as rain and rivers, lakes and seas. It is an essential element for the survival of living beings. With two third of earth's surface covered by water and human body consisting of 75% of it, it is evidently clear that water is one of the prime elements responsible for life on earth. Groundwater is an important source of water supply throughout the world. Groundwater occurs almost everywhere beneath the earth surface not in a single widespread aquifer but in thousands of local aquifer systems and compartments that have similar characters. Water from beneath the ground has been exploited for domestic use, livestock and irrigation since the earliest times. It is however common for the dominant role of groundwater in the freshwater part of hydrological cycle to be overlooked.Groundwater is easily the most important component and constitute about two third of fresh water resources of the world and Groundwater accounts for nearly 90% all usable freshwater.So it is our responsibility to protect and save the groundwater from the harmful effects that has come from the industrial wastes brought by rivers for our basic needs.

Ground water quality is important to humans. Therefore it is important to ensure its quality is high at all time so that the consumer health is not compromised. Groundwater resources are affected mainly by three major activities:-

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(i) excessive use of fertilizers and pesticides in agricultural areas,
(ii) untreated/partially treated wastewater to surface water bodies and
(iii) excessive pumping and improper management of groundwater resource.

Solid waste disposal in open landfill is the one of the factor that causes ground water pollution due to lack of pollution control interventions such as water proof layer, treatment pond, monitoring wells, etc. Groundwater pollution also occurs due to disposal of toxic wastes, especially from industries or undetected leakage from pipes, waste storage containers, or underground tanks. Contamination of groundwater by domestic, industrial effluents and agricultural pollutants is a serious problem being faced by developing countries. The industrial waste water, sewage sludge and solid waste materials are currently being discharged directly into the environment indiscriminately. These materials enter subsurface aquifers resulting in the pollution of irrigation and drinking water. High rates of mortality and morbidity due to water borne diseases are well known in India. Therefore, access to safe drinking water supply remains an urgent necessity.

The quality of water is defined in terms of its physical, chemical and biological parameters. In some areas of the world, people face serious drinking water shortage because of the ground water pollution. Thus, evaluation of groundwater quantity and quality is important for the development of further civilization and to establish database for planning future water resources development and management strategies. The quality of water may depend on geology of particular area and also vary with depth of water table as well as seasonal changes and is governed by the extent and composition of the dissolved salts depending upon the subsurface environment.

2. STUDY AREA

2.1 LOCATION

Ambala district is one of 21 districts of Haryana state in the country of India. It borders district Yamunanagar to the east, district Siramur to the North, district Mohali and Patiala to the West, and the district of kurukshetra to the South. The Lat Long of the district are30.2862° N, 76.9643° E.

According to the 2011 censusAmbala district had a population of 1,128,350. It ranks 410th (out of a total of 640) in India in terms of population. The district has a population density of 720 inhabitants per square kilometer (1,900/sq mi) .Its population growth rate over the decade 2001-2011 was 11.23%. Ambala has a literacy rate of 81.75%.Hindi is the official languages and thus used for official communication.

2.2 GEO-MORPHOLOGY AND SOIL TYPES

The district area is occupied by Indo-Gangeticalluvim. There are no surface features worth to mention except that the area is traversed and drained by seasonal streams namely Tangri, Beghna and Markanda. Physiographically the area is flat terrain. However a little part in the extreme northeastern area of the district is occupied by Siwalik hills, and falls in the zone of "Dissected Rolling Plain". The area slopes towards southwest with an average gradient of 1.5m/km. The general elevation in the district varies between 245 m to 300 m above MSL. The soils are non-calcareous and sandy loam on the surface, and loam to clayey loam at depth, and placed under the classification of soil as Udipsamments/Udorthents.

3. METHODOLOGY & RESULTS

The Physico-chemical analysis is performed as per the standard methods (APHA, 1992). To check the results of laboratory analysis, ionic balance has also been done. A total number of eleven water quality parameters were selected. The details of various water quality parameters, analytical methods and equipment's are given in Table

S. No.	PARAMETER	METHOD	EQUIPMENT
1	pH	ELECTROMETRIC	pH METER
2	CONDUCTIVITY	ELECTROMETRIC	CONDUCTIVITY METER
3	TDS		CONDUCTIVITY/TDS METER
4	BICARBONATE	TITRATION BY H_2SO_4	TITRATION
5	SULPHATE	TURBID METRIC	TURBIDITY METER
6	CHLORIDE	TITRATION BY $AgNO_3$	TITRATION
8	CALCIUM	TITRATION BY EDTA	TITRATION
9	MAGNESIUM	TITRATION BY EDTA	TITRATION
10	SODIUM	FLAME EMISSION	FLAME PHOTOMETER
11	HARDNESS	TITRATION BY EDTA	TITRATION

TABLE: 1 Parameters and the method of testing equipment

In ACRGIS lat-long location of AmbalaDistrict :-

FIG: 1 ADDING PARAMETERS TO THE GRAPH

Now add all the parameters to theLat-long chart such as carbonate , bicarbonate , sodium , chlorine , ph , calcium

SNO	BLOCK NAME	LATITUDE	LONGITUDE	CO_3	HCO_3^-	Cl^-	SO_4	$Ca^{++}Mg^{++}$
1	AMBALA	30.3782	76.7767	1.5	10.5	5	176	9.8
2	BARARA	30.212	77.04	0	4.5	2	64	4.9
3	KESRI	30.4334	76.9052	0	5	1	65	5.3
4	JANSUI	30.2075	76.6855	1	6.5	4	75	2.9
5	JANDHERI	30.0933	76.6102	0.5	5.5	8	95	4.8
6	MULANA	30.2752	77.0475	1	4	6	70	6.5
7	LANDHA	30.2238	76.8807	0.5	6.5	7	44	4.5
8	BINJALPUR	30.3066	77.1334	0	5	5	80	8
9	NARAIANGARH	30.4784	77.1312	1	4.25	4	120	4
10	KALA AMB	30.4992	77.207	1	5	6	55	5.2
11	KHANPUR	30.5356	77.1161	1	3	8	92	6.5

FIG: 2 Lat-long chart

You can see the image with that particular parameter in different places in Ambala district.

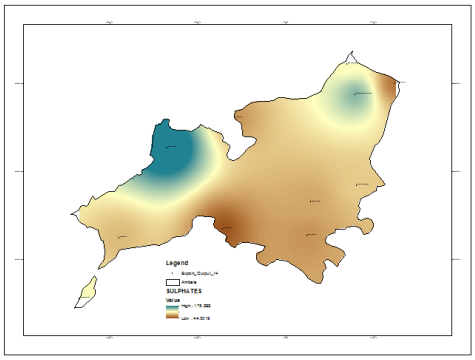

FIG : 3 Ambala map locating sulphate values

This is the example image of the Sulphate values of the particular places in Ambala district.

4. RESULT AND DISCUSSIONS

4.1 WATER ANALYSIS

Water samples were collected for analyzing the different parameters at the nuclear laboratory in NIH, Roorkee. The result of water quality parameters are described below:-

4.1.1 pH

The ground water is alkaline in nature of the district. The pH values ranges from 7.07 to 10.10 indicating that the ground water is neutral to alkaline (weak base type in nature). The pH values range from 7.14 at Kuralito 8.28 at Pinjola with a mean pH value of 7.75. It is moderately to highly mineralized.

4.1.2 ELECTRICAL CONDUCTIVITY (EC)

The overall range of the electrical conductivity varied between 620µmho/cm and 3770µmho/cm in all the collected samples of water which includes the sources such as river, pond, and groundwater. In most of the water samples EC is below 2000µmho/cm and an average EC is 1955µmho/cm in the area.

4.1.3 TOTAL DISSOLVED SOLIDS (TDS)

TDS were found in overall study area between 100ppm to 9000ppm.According to BIS (IS: 10500-1991) the agreeable value of TDS is 500mg/l and maximum is 2000 which is suitable for a drinking water. The samples that we have taken from different sites of our study area having a TDS less than its permissible value and greater than the permissible value therefore it is quite visible that the water is suitable for drinkingin few areas and the water has to be treated in areas whose values are greater than the permissible limit.

4.1.4 CHLORIDE

The overall range of the Chloride of all the water samples those were collected from different sites of our study area is within the desirable range of 250mg/l so that the water may be used for drinking water purposes and it varies between 13mg/l at AmbalaCantt. and 375mg/l at Kurali with mean value of 175mg/l.

4.1.5 BICARBONATE

The range of the Bicarbonate of all the water samples extended from 320mg/l to 1051mg/l. Its average value is 632mg/l.

4.1.7. SULPHATE

The concentration of Sulphate content in ground water ranges from 28mg/l at Khan Ahmadpur to 250mg/l at Kurali with exception of ground water of Pinjola where its concentration is 620mg/l. According to BIS (IS: 10500-1991) the agreeable value of Chloride with in 200mg/l which is suitable for a drinking water. Samples that were collected from different sites of our study area having a value of Chloride less than its desirable is usable for drinking water purposes.

4.1.8. NITRATE

Nitrate concentrationis within the permissible limit (45mg/l) and it ranges from trace at few places to 214mg/l at Kakru with an average of 71mg/l. According to BIS (IS: 10500-1991) the agreeable value of Nitrate within 50mg/l which is suitable for a drinking water. The value of Nitrate that was found in all the collected samples from different sites of study area are within the desirable value therefore the water is suitable for drinking water purposes.

4.1.9. CALCIUM

The range of the Calcium in majority of ground water samples, the concentration isless than 100 mg/l and their average concentration is 84mg/l.According to BIS (IS: 10500-1991) the agreeable value of Calcium is 75mg/l and maximum value is 200. According to desirable value and permissible value the range of allover samples falls under the permissible value. Hence it is quite visible that water is suitable for drinking purposes.

4.1.10. MAGNESIUM

The range of the Magnesium in majority of ground water sample ranges between 9.7mg/l at Panjokhera and 111 mg/l at Kurali. In majority of ground water samples, magnesium concentrations are less than 100 mg/l and their average concentrations is 45mg/l respectively.According to BIS (IS: 10500-1991) the agreeable value of Magnesium with in 30mg/l, except few samples of groundwater sources the range of all over samples falls under its prescribed limit therefore it appeared that the water is suitable for drinking purposes.

4.1.11 SODIUM

The range of overall Sodium varied from 83mg/l to 325mg/l. According to BIS (IS: 10500-1991) the agreeable value of Calcium is 200mg/l and maximum value is 400. According to desirable value and permissible value the range of allover samples falls under the permissible value. Hence it is quite visible that water is suitable for drinking purposes.

4.1.12 TOTAL HARDNESS

The range of hardness ranged from 120mg/l to 510mg/l. According to BIS (IS: 10500-1991) the agreeable value of total hardness is 200mg/l and maximum value is 600. According to desirable value and permissible value the range of allover samples falls under the permissible value. Hence it is quite visible that water is suitable for drinking purposes.

5. CONCLUSION:

From the above results we conclude that water is suitable for drinking purpose since the water quality parameters such aspH, Electrical Conductivity (Ec), Total Dissolved Solids (Tds),Chloride, Bicarbonate, Sulphate,Nitrate, Calcium, Magnesium, Sodium, Total Hardness are in desired permissible rangesby plotting water quality parameters and locations in ARCGIS it is easier for us to identify the sulphur content and other such parameters.

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