

Assesment of Ground Water Quality of Southern Jaipur City

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Abstract—Ground water is a major and important source of drinking and Irrigation and its quality is a critical issue around the world. Groundwater quality is affected by different natural as well as anthropogenic processes. Ground water has to be checked before use for drinking and irrigation purposes to avoid Health issues. For this Purpose water samples will be collecting from 40 different localities of Jaipur around 20 physiochemical and other parameters including Temperature, pH, electrical conductivity (EC), total dissolved solid (TDS), Fluoride, Salinity measured on site using potable meter (PCS Test 35 Multi-parameter), Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Sodium (Na^+), Bicarbonate (HCO_3^-), Chloride (Cl), Sulphate (SO_4^{2-}), Nitrate (NO_3^-), Soluble Sodium Percentage (SSP), Permeability Index (PI), Residual Sodium Bicarbonate (RSBC), Magnesium Adsorption Ratio (MAR), Kelly's Ratio (KR) and Sodium Adsorption Ratio (SAR) in laboratory. Quality parameters like SAR, RSC, % Na, PI and CAI are calculated. Classification based on SAR and Salinity Hazard by Wilcox analysis will considered as excellent (S1, 100 %), good (C2, 86.66%) and doubtful (C3, 6.66%) categories respectively. Then results will compare with standard guidelines of World Health Organization (WHO) and BIS for groundwater quality. GIS software will used for quality measurement of unsampled areas.

Keywords: Ground water, physio-chemical parameters, GIS software, SAR, salinity hazard.

1. INTRODUCTION

Spatial variations in ground water quality in the Jaipur City located in the Rajasthan State, India, will be studied using geographic information system (GIS) technique. GIS, a tool which is used for storing, analysing and displaying spatial data is also used for investigating ground water quality information [1]. For this study, water samples will be collected from the bore wells and open wells representing the various zones of Jaipur city area. The water samples will analysed for physio-chemical parameters like TDS, TS, pH, using standard techniques in the laboratory and compared with the standards.

There are tens of thousands of unaccounted for wells throughout Jaipur, since tapping of groundwater is still a landowner's right. There is a lack of adequate water supply and demand accounting, both in terms of government water supply and private water supply [2]. In addition to water scarcity, degradation in quality of both surface and

groundwater sources is of great concern. The ground water quality information maps of the entire study area will be prepared using GIS spatial interpolation technique for all the above parameters [3]. The results obtained in this study and the spatial database established in GIS will be helpful for monitoring and managing ground water pollution in the study area.

2. MATERIALS AND METHODS

Forty different samples were collected from different areas of Jaipur to determine the ground water quality. The samples were collected in high grade plastic bottles of 1 liter capacity after rinsing with distilled water the standard technique and methods were followed for collection preservations analysis and interpretations. The physicochemical characteristics of ground water samples where determined by using standard methods parameters.

3. METHODS AND MATERIAL

Different type of methods are used for testing the water sample and its quality such as chemical content including total solid, total dissolved solid and total hardness whereas physical content as Conductivity Color and pH [4]. Physical and chemical testing will be done in laboratory for understanding the quality of water. Comparing the physical and chemical properties of ground water collected from different places of Jaipur. The different locations of water will show on GIS system with their coordinates.

4. RESULT AND DISCUSSION

Water samples were collected from southern part of Jaipur city. Three zones of Jaipur development authority (JDA) boundary have been selected for this research work. Samples were collected from these zones. 12 samples from Zone 4, 15 samples from zone 8 and zone 9 were analyzed. Conductivity, pH, total dissolved solids (TDS), total solids (TS) and total hardness (TH) is assessed for samples collected from different zones of southern part of Jaipur.

Testing result of water quality such as pH, conductivity, TDS, TS and TH are showed in table 1 of zone 4.

Table 1: Water Testing Result Zone 4

LOC. No.	pH	Conductivity (msm/cm)	TDS (ppm)	TS (ppm)	TH (mg/l)
L1	8.2	0.51	441.6	1437.1	111.2
L2	8.7	0.63	398.6	1393.2	141.5
L3	8.0	0.53	403.7	1590.3	138.7
L4	7.9	2.68	349.8	1448.7	160.8
L5	7.6	0.61	339.6	1497.8	199.2
L6	8.1	0.56	401.2	1307.6	181.6
L7	8.2	4.01	400.7	1299.7	174.3
L8	8.1	0.71	498.6	1441.8	147.6
L9	7.9	0.51	393.7	1500.8	191.8
L10	7.6	0.92	368.8	1477.6	127.6
L11	8.2	2.06	320.7	1400.1	117.5
L12	8.1	3.05	338.2	1391.7	109.7

As shown in Table 1, Conductivity is ranged from 0.51msm/cm to 4.01msm/cm, which indicated a huge variation in minimum and maximum value. Maximum value of pH is 8.7; whereas minimum value is 7.6. It indicated not much variation in the pH value in zone 4. TDS value vary from 320.7 ppm to 498.6 ppm, it indicates a huge variation as well as high TDS range in the water sample. However TS value range from 1299.7 ppm to 1500.8 ppm in zone 4. This value is also high in this zone as well big gap between minimum value and maximum value as indicated in Table 1. Total hardness is increased from 109.7 mg/l to 199.2 in different locations of zone 4. It is clearly visible from Table 1 that pH value is somehow acceptable but rest of properties specially TDS, TS and TH is not acceptable in any case.

As shown in Table 2, TDS value vary from 341.2 ppm to 490.8 ppm, it indicates a huge variation as well as high TDS range in the water sample. Total hardness is increased from 109.7 mg/l to 211.7 in different locations of zone 8. Maximum value of pH is 8.6; whereas minimum value is 7.5. It indicated not much variation in the pH value in zone 8. Conductivity is ranged from 0.49msm/cm to 4.02msm/cm, which indicated a huge variation in minimum and maximum value. However TS value range from 1277.2 ppm to 1507.5 ppm in zone 8. This value is also high in this zone as well big gap between minimum value and maximum value as indicated in Table 2. It is clearly visible from Table 2 that pH value is somehow acceptable but rest of properties specially TDS, TS and TH is not acceptable in any case.

Table 2: Water Testing Result Zone 8

LOC. No.	pH	Conductivity (msm/cm)	TDS (ppm)	TS (ppm)	TH (mg/l)
L1	7.9	0.62	398.6	1437.2	166.2
L2	7.5	0.64	377.60	1507.5	171.40
L3	7.6	2.10	341.9	1443.6	193.2
L4	7.9	0.50	401.7	1377.6	131.1

L5	8.2	2.10	408.80	1341.50	147.70
L6	8.3	3.50	410.10	1346.10	202.50
L7	7.9	0.81	390.70	1277.20	211.70
L8	7.9	0.49	371.80	1503.70	177.60
L9	8.1	0.62	341.20	1308.80	142.90
L10	8.2	0.94	403.10	1407.20	148.70
L11	7.9	4.02	410.70	1448.60	109.70
L12	8.2	3.60	411.10	1303.70	198.60
L13	8.2	0.98	400.20	1298.60	191.20
L14	8.6	1.05	490.80	1299.30	190.70
L15	7.7	3.02	341.70	1338.60	147.60

As shown in Table 3, TDS value vary from 301.6 ppm to 411.3 ppm, it indicates a huge variation as well as high TDS range in the water sample. However TS value range from 1298.5 ppm to 1503.4 ppm in zone 9. This value is also high in this zone as well big gap between minimum value and maximum value as indicated in Table 3. Total hardness is increased from 136.2 mg/l to 241.7 in different locations of zone 9. Maximum value of pH is 8.1; whereas minimum value is 6.1. It indicated not much variation in the pH value in zone 9. It is clearly visible from Table 3 that pH value is somehow acceptable but rest of properties specially TDS, TS and TH is not acceptable in any case. Conductivity is ranged from 0.61msm/cm to 4.10msm/cm, which indicated a huge variation in minimum and maximum value.

Table 3: Water Testing Result Zone 9

LOC. No.	P H	Conductivity (msm/cm)	TDS (ppm)	TS (ppm)	TH (mg/l)
L1	7.9	4.10	401.20	1448.60	171.60
L2	7.9	0.80	401.10	1441.7	181.20
L3	8.1	0.52	393.30	1407.60	163.70
L4	8.1	0.72	390.40	1448.50	142.60
L5	8.1	3.45	410.50	1398.60	136.20
L6	8.1	0.82	320.60	1377.60	143.70
L7	7.9	2.10	330.80	1503.40	193.20
L8	7.7	3.60	348.70	1421.50	171.70
L9	7.9	0.61	341.60	1471.60	193.80
L10	8.4	0.82	301.00	1298.50	179.70
L11	7.2	1.73	400.80	1307.60	204.90
L12	7.9	2.10	338.60	1440.80	241.70
L13	6.1	0.76	400.20	1491.71	211.20
L14	7.5	1.24	411.30	1501.80	149.70
L15	7.6	3.60	313.60	1436.90	150.30

The result suggested huge variation in all the chemical properties of water samples collected from all three zones. It is found that not a single location is full filling the condition of potable water.

5. CONCLUSION

In conclusion, almost all results reveal that most of the water samples were alkaline in nature. The values obtained were compared with standards of BIS, ICMR, USPH and WHO.

From the observations, it may be inferred that the concentration of pH, TS were within permissible limits but EC, TDS, TH values showed the poor water quality in most of the studied groundwater samples. It may be accomplished that the water of the various samples were unfit for drinking purpose without further treatment.

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