

Assessment and Analysis of Impurities in Ground Water of Sunder Nagar – A Case Study

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ABSTRACT: The management of ground water quality is a major environmental challenge in now a days. Monitoring the different sources of pollutants load contribution to the ground water is quite difficult. The main objective of this present study is the Assessment and analysis of impurities of Ground water in Sunder nagar Town of Mandi District of Himachal Pradesh India .

To determine the impurities of ground water in Sunder Nagar area, the following Physical as well as the Chemical processes were conducted to determine various physical and chemical characteristics. The five sites were chosen randomly for taking sample of ground water i.e Sample 1 is taken from village Bherjwanu, which is an agriculture area. Sample 2 is taken from DhanotuNH23(National Highway) ,Sample 3 is taken from chambi area(which is an residential area).Sample 4 is taken from Jangam bag the place of JAMADAGNI RISHI .He is one of the Saptarishis in the seventh, and he is the father of Parashurama .Sample 5 is taken from Sukhdevvatika, (Which is place of sukhdev muni). All of these sample were collected from Tehsil Sunder nagar in order to evaluate the Ground water suitability for drinking and agricultural purpose. For this purpose, we have conducted Physical process test i.e. pH (alkalinity test), turbidity, conductivity ,Total dissolved solids(TDS),Temperature test. The chemical Process tests includes Residual chlorine test, Hardness of water,Alkalinity of water ,Chloride, Presence of Fluoride,Iron, Nitrate. These all tests were performed in IPH (Irrigation & public health department) Lab of SunderNagar circle.

I. INTRODUCTION

Ground water is very necessary natural resource not only for a state or country, but for entire world living beings. Ground water is the

water that seeps through rocks and soil which is stored below the ground. The rock in which ground water is stored are called aquifers. Water moves through these rocks because they have large connected spaces that make them permeable. In other words we can also say that Ground water is the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rock that is named aquifer.

Water is an very necessary basic element for sustainability of life on earth. And now a days increasing population is the major problem in growing demand of Ground water used for drinking, irrigation, industry, and hydroelectricity which also impact the quality of water. In our India 85% of population drinking water needs are fulfilled by the aquifers due to which level of ground water is decreasing in our country. This excessive use of ground water and pollution in surface water which is caused by the discharge of the untreated waste, dumping of industrial waste, runoff from agriculture field puts a lot of pressure in Ground water resources. This leads to the decrease in Ground water quality and depletion of natural resources.

Many countries has developed specified standard for their own country. In our India the water quality standards are defined by the Bureau of Indian Standard (BIS).This BIS Code 10500: Revised 2012 sets the standard for water quality parameters of drinking water.

II. OBJECTIVES OF THE STUDY

1. To determine the Physical Analysis of ground water around Sundernagar Area.
2. To determine the Chemical Analysis of ground water around Sundernagar Area and remedial measure to be suggested.
3. To determine the statistical correlation

between different parameters.

III. METHODOLOGY

From the very beginning firstly five different sites have been selected in the Sundernagarblock for taking the sample of Ground water testing. It has been properly checked the information and descriptions of the local authority that is responsible for maintenance of ground water sources in the vicinity of the area under the investigation.

The Ground water samples were collected in the properly sterilized bottle having capacity of about 1-1.5 liter, so that the sample collected from each individual sites were sufficient to undertake all the physical (pH Test, Turbidity Test, Conductivity Test and TDS Test) as well as chemical tests (Residue Chlorine Test, Hardness Test, Alkanity Test, Chloride Test, Flouride Test, Iron Test and Nitrate Test Test). All the tests were performed quickly, as soon as possible, because environment temperature might effect the properties of water samples. The Lab where all the tests were performed ia as shown in the figure 3.1.



Figure 3.1: The View of Testing lab Procedure Of Residual Chlorine Test

- 1) Taking a 10ml sample of water and adding Ortho-Tolidine 3-4 drops in the sample. if no colour changes that mean the chlorine is absent.
- 2) If colour changes after the addition of Ortho-Tolidine, match it with the standard colour chart of Residual chlorine test.



Figure 3.2: StandaradColour Chart Of Residue Chlorine Test

- 3) If the colour is white i.e. value is 0.0PPM mg/l that means no chlorine is present and it is chlorine free water which is under very safe zone.
- 4) If the colour of water sample become light yellow and value is 0.1- 0.2 PPM mg/l then it is considered in safe zone.
- 5) When the colour of water sample become more yellow from light yellow i.e. 0.4PPM mg/l then it is in alert zone.
- 6) And above 0.4- 1.0 PPM range Water is not in use of drinking.

pH VALUE TEST

The pH stands for Potential Hydrogen. pH is the measure of hydrogen ion concentration , or in other words, it is the measure of acidity or alkalinity of the sodium . The pH scale ranges from 0 to 14 is as shown in figure3.4 .



Figure 3.4: pH Scale

- 7) pH value of pure water is = 7 (Which is neutral point)
- 8) The solution having pH less than 7 are acidic and while those with a pH greater than 7 are basic or alkaline. pH range for drinking water is 6.5 to 8.5 (unit less). If the pH value is below 6.5, then it means solution is acidic and likely to be contaminated with pollutants, and water is unsafe for drinking purpose. When the

pH value increases from 8.5 then the solution is basic or alkaline which does not have any taste change but excess of alkalinity in our body cause gastrointestinal issue.

IV. RESULTS & DISCUSSION

The results of test samples from different sites, are given in sequence form. This results of

different tests have been sequenced in order to compare the ground water quality of various sites under investigation. All of the tests were conducted under laboratory, with digital meters & tool kits , chemical processes. Based on the above observation, a set of data is prepared with various parameters.

Table4.1: Results of Different Test

Test Name/Sample	Sample1	Sample2	Sample3	Sample4	Sample5	Safe -Unsafe zone Range
Residual Chlorine test	0.0	0.0	0.0	0.0	0.0	0.2-0.4
pH Value test	6.7	7.7	7.82	7.32	6.96	6.5-8.5
Conductivity test	463	281	297	226	512	800-1000
HardnessTest	300	166	146	170	252	0-200
Turbidity test	0.0	59	48	0	1	0-5
T.D.S. Test	303	183	195	226	335	0-500
Chloride test	21	10	11	8	34	0-250
Alkalinity Test	260	195	179	150	200	0-200
Fluorides Test	0	0.5	0	0.1	.5	1-1.5
Nitrate test	0.5	25	10	10	10	10-45
Iron Test	0.3	0.5	0.5	0.3	0.3	0-0.5

Results of all the above parameters for different samples named S1,S2,S3,S4,S5 and S6(which shows permissible limits) are shown in table 4.1 and figures 4.1 to 4.11. From Table4.1, No residue of chlorine were found in all the samples of ground water taken from different places. Due to no chlorine present in the water can cause risk of bacterial contamination .pH value of all these ground water samples were found to be with in the permissible limits and hence water is applicable for drinking purpose as shown in figure 4.1. In figure 4.2, Conductivity of all these five ground water samples were found in safe zone and is hence applicable for drinking purpose. Figure 4.3 shows the result of hardness test sample S1 and sample S5

is not in safe zone and hence not applicable for drinking purpose because tolerance value of hardness for drinking water is 200mg/l but hardness of these samples exceeded from 200mg/l. Effective measures should be adopted to reduce the hardness of these two samples. Hardness of other samples(S2, S3, S4) were found to be in safe zone hence applicable for drinking purpose. Figure 4.4 shows the results of turbidity test. Turbidity of S1, S4, S5 were found with in permissible limits whereas sample S2 and S3 were found above the safe limits hence not applicable for drinking purpose. It requires proper filtration processes to use it for drinking purpose.

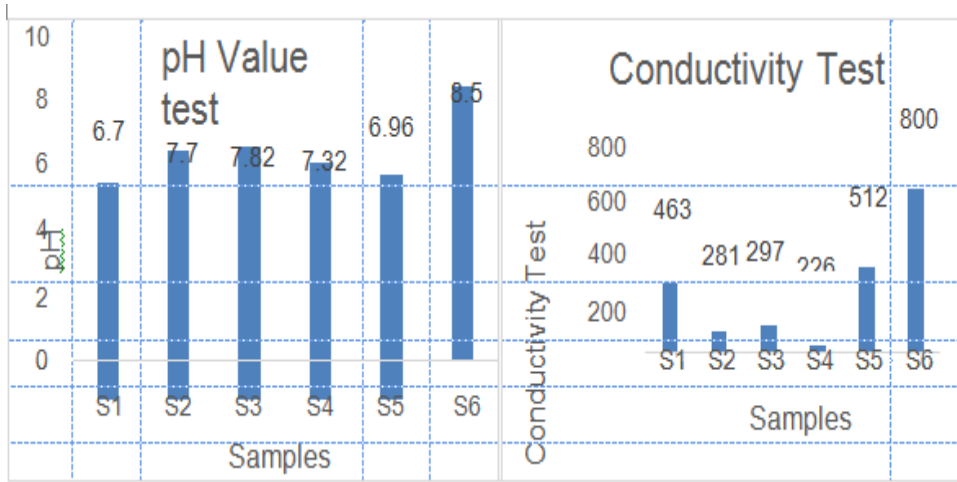


Figure4.1: pH Value Graph

Figure4.2: Conductivity Test Value Graph

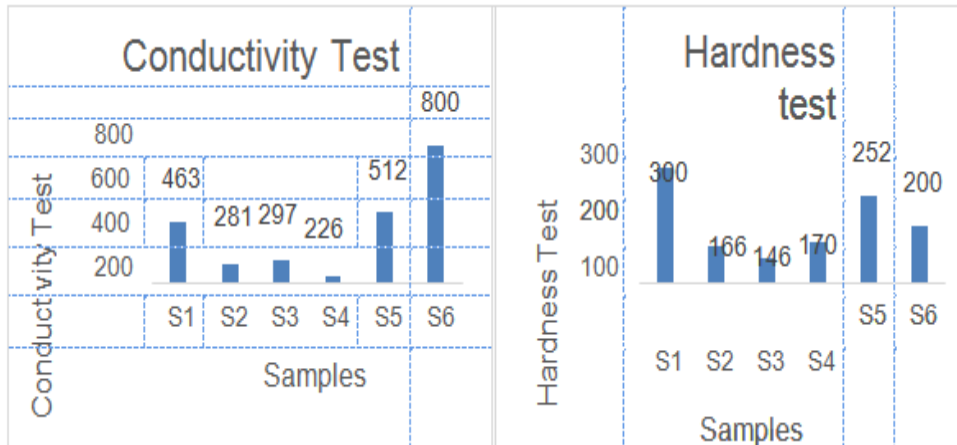


Figure 4.3 pH Value Graph

Figure4.4: Hardness Test Value Graph

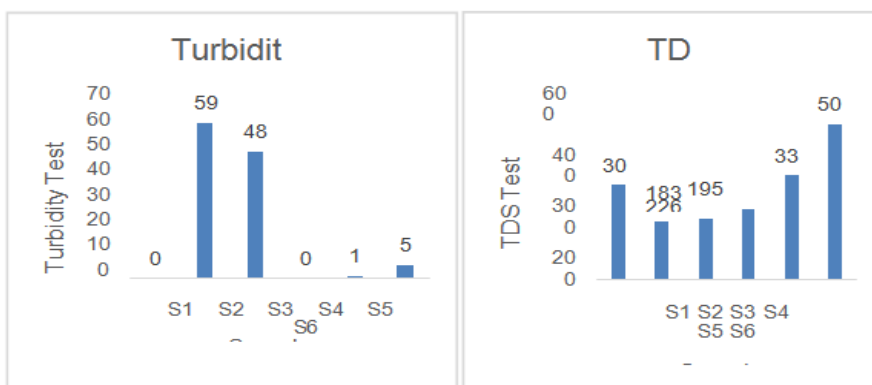


Figure4.5: Turbidity Test Value Graph

Figure4.6 :TDS Test Value Graph

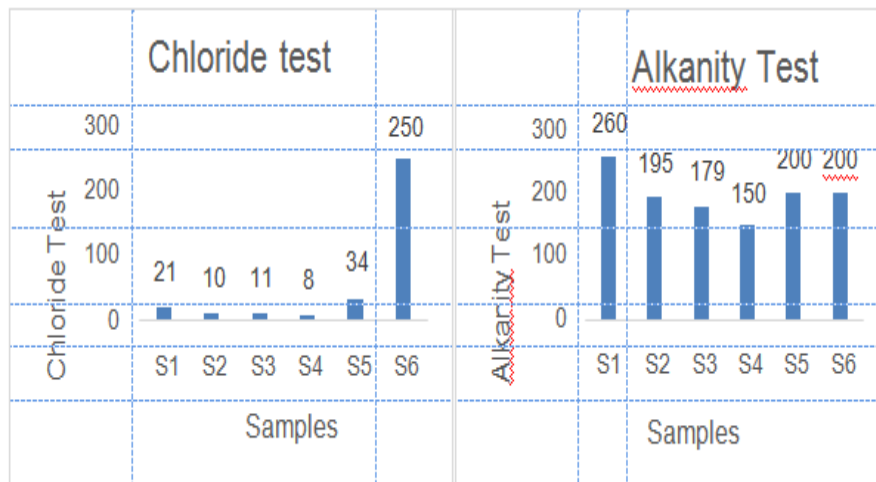


Figure4.7: Chloride Test Value Graph

Figure4.8: Alkanity Test Value Graph

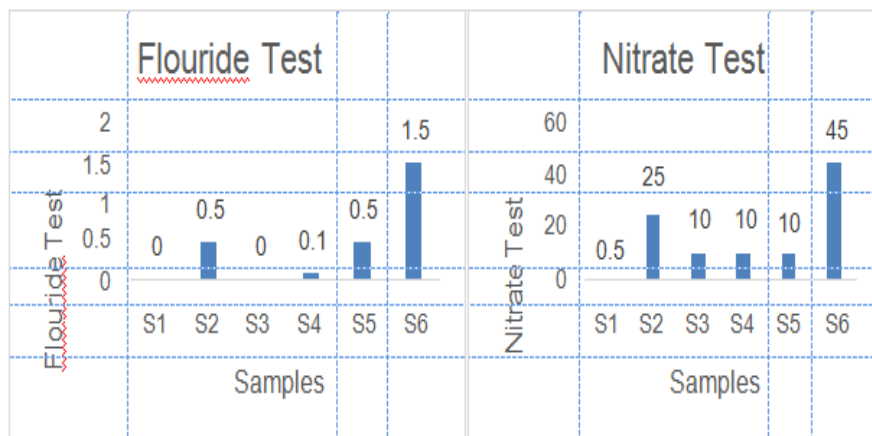


Figure4.9: Flouride Test Value Graph

Figure4.10: Nitrate Test Value Graph

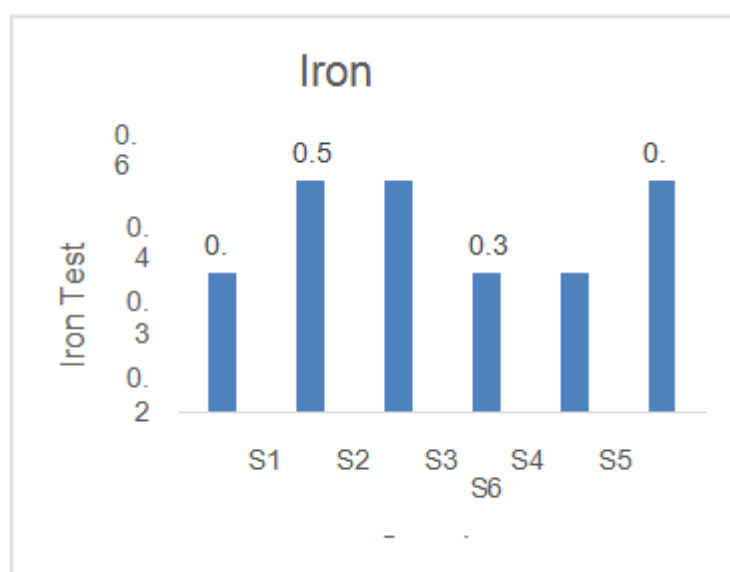


Figure4.11: Iron Test Value Graph

V. CONCLUSION

The present investigation has led us to conclude that the quality of water samples undertaken for the study was acceptable from majority of physical processes testing parameter except Turbidity test of sample 5, which is problematic for drinking purpose. High turbidity in drinking water can shield bacteria or other organisms so that chlorine cannot disinfect the water as effectively. Some organism found in water with high turbidity can cause symptoms such as nausea, cramps, and headach. Ultrafiltration membrane system and reverse osmosis is necessary for this. In Chemical processes test parameters, water is applicable for drinking purpose except Hardness of sample 1 and sample 5 is not applicable for suitable use as it requires effective measures to be taken to reduce the temporary & permanent hardness by boiling water or using R.O. system. Therefore Alkalinity of sample 1 is also not applicable for drinking. Too much alkalinity may also agitate the body's normal pH, leading to metabolic alkalosis, a condition that may produce the following symptoms: nausea, vomiting. For which preventive measures should be taken into consideration before using it for drinking purpose. The study has revealed that the ground water resource of study area in few cases, the hardness of water, turbidity & alkalinity of water is more than the permissible limit. The ground water resource needs to be treated to make it more palatable and useful. A comparative study between pH value Test and Turbidity Test Value, Hardness Test value and Turbidity Test Value, Chloride Test value and Alkanity Test Value, Flouride Test value and Nitrate Test Value. A poor correlations were observed b/w pH & Turbidity, Hardness & Turbidity and Chloride & Nitrate test values, Avery good correlations was observed b/w Flouride and Nitrate test values.

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