

Water quality analysis of some ground water resources in Nohar city

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Abstract- As water is an integral part of structures found on earth crust as well as all the living organisms on the earth. It is very important to study its quality which is best suited for the living system in present study water samples were collected from major ground resources situated in Nohar city, which is used by local people for various activities. During summer season separate sample from each resource was collected in glass bottles and rushed to laboratory for its testing. Immediate testing was done by using standard methods for pH, Alkalinity, Water hardness, Chlorine content and it's TDS. The study denotes that the water from these resources is quite good for all the activities except drinking by human beings.

INTRODUCTION

Water plays very important role in our ecosystem because it is integrated with very important organic and inorganic compounds found on our earth crust as well as it is directly related to living organisms because it imparts in almost each and every biochemical reaction happening in the living system. So it is important to study some quality aspects of water which is used by human beings for various activities in Rajasthan especially during summer season, The surface waters are not sufficient to combat human demand for their normal activities, So for drinking purpose people residing in Rajasthan uses surface water but for other activities other sources are searched as bored well, Open Well and hand pumps etc but in some instances surface water is not too sufficient to combat the drinking demand of the local people sometimes local people used to drink water obtained from groundwater resources and normally they use groundwater resources for washing and other activities. It is very important to study that quality of groundwater systems in terms of pH, Alkalinity, Water hardness, Chlorine content and it's TDS. In present study, during my summer break I collected samples from various water resources which are used for various activities by humans in the Nohar city situated in Hanumangarh district of Rajasthan state.

Location of study area

Nohar city is a tehsil headquarter in Hanumangarh district of Rajasthan state having geographical coordinates 29.18°N 74.77°E. Water samples were collected from 5 different ground water resources situated at different locations in the city.

REVIEW OF LITERATURE

Recently many researchers carried out extensive studies on ground water qualities and standardizing the analysis methods for these particular parameters considered for water quality analysis. Use of chemical pesticides and other chemicals in daily life activity maybe an important impact on ground water quality also. In 1983 an extensive study for fluoride and nitrate levels of groundwater of arid districts of Rajasthan was carried out by Gopal *et al.* Quality of well waters of some water sheds of western Rajasthan and its utilization was studied by Johari and khetawat in 1984. Gupta *at al* (1993) studied fluoride distribution in groundwater of south eastern Rajasthan. Saxena and Chhabra (1998) studied chemical surveillance of drinking water supply in desert city Bikaner which was based on mainly groundwater quality. An extensive study for chemical and biological quality aspects of water in Nohar city and nearby area was carried out by Sharma SP in 2002.

MATERIALS AND METHODS

The methods for quality analysis of water samples adopted in this research paper are according to Goldman *et al* (1978), Trivedi and Goyal (1984), APHA (1985), Purohit SK (1986), Saxena MM (1987) and PHED Rajasthan (1994).

Fresh water samples from the selected water resources of Nohar city were collected using glass bottles and immediately sent to laboratory for pH, Alkalinity, Water hardness, Chlorine content and it's TDS tests.

pH – It was determined in the field with the help of narrow range pH indicator strips this was further confirmed in the laboratory immediately within one hour using a digital pH meter.

Alkalinity-

the capacity of the sample to donate OH⁻ or accept H⁺ ions to neutralize an acid of known strength is called alkalinity. The alkalinity of natural waters is normally due to presence of bicarbonate, carbonate and hydroxide compounds of calcium, magnesium, sodium and potassium. Borates, phosphates and silicates also contribute to alkalinity. Some other ions not ordinarily found in natural water such as arsenate, aluminate and certain organic anions in coloured waters could also increase the alkalinity.

Phenolphthalein and methyl orange alkalinity –

These are determined by acid titration method. For this purpose, HCL of 0.1N strength was employed with phenolphthalein and methyl orange indicators. 50 ml of water sample was taken and 2 to 3 drops of phenolphthalein indicator was added if no pink coloration occurs there is no phenolphthalein alkalinity, if a pink colour appears then phenolphthalein alkalinity is present and

sample was titrated with 0.1N HCl solution until the sample becomes colorless. The same water sample was further used to determining the methyl orange alkalinity, 2 or 3 drops of methyl orange indicator was added in the same flask and continue to titrate against hydrochloric acid until yellow colour of solution turns orange. The titration readings when multiplied by 20 gave the phenolphthalein or methyl orange alkalinity in ppm (as CaCO₃) respectively.

Water hardness-

Total hardness the total hardness of water is sum of concentration of alkaline earth metal cations present in it calcium and magnesium are the principal cations causing hardness total hardness is expressed in terms of CaCO₃.

Total hardness was determined by the EDTA titrimetric method. In this method 50 ml of water sample mixed with one ml of ammonia buffer solution and 4 to 5 drops of Eriochrome black t indicator was titrated against EDTA solution until the wine red colour of sample turned blue (end point).

Calcium hardness- Calcium hardness was also determined by the EDTA titrimetric method in this method 50 ml of water sample mixed with one ml of NaOH solution and a pinch of murexide indicator was titrated against EDTA solution until the pink colour turned purple (end point).

Magnesium hardness-

Magnesium hardness was calculated by the values of total hardness and Calcium hardness

Mg-H(as CaCO₃) mg/liter = Total hardness (as CaCO₃) mg/liter - Calcium hardness (as CaCO₃) mg/liter

Carbonate hardness and non-carbonate hardness- This hardness was determined by the values of total hardness and alkalinity these are expressed in terms of calcium carbonate

Chloride- Chloride is the common anion found in water and sewage. Chloride was determined by Mohr's titration method. In this method 50 ml of water sample mixed with 2 ml of water with K₂CrO₄ (potassium chromate indicator) was titrated against 0.02N AgNO₃ (silver nitrate solution) until a persistent brick red colour appeared due to indicator (K₂CrO₄) the colour of sample becomes yellow and after the titration, yellow colour turned into brick red colour the titer reading when multiplied by 14.2 gave chloride as mg/liter.

Total dissolved solids

To determine TDS, 100 ml of well mixed sample was taken and filtered through a filter paper Now a weighed dish was taken and filtered sample placed in it, It was then placed on the water bath for evaporation after evaporation only residue was the remaining matter this residue was placed in a hot air oven at 180°C for at least one hour and subsequently cooled and where the increase in weight the dish equals the residue. The result was expressed as total dissolved solids at room temperature in terms of mg/liter the following formula was adopted

$$\text{TDS mg per Liter} = \frac{\text{mg of residue} \times 1000}{\text{ml of sample}}$$

Important Findings

| Table Showing test results for water samples | | | | | | | | | | | | |
|--|------------------------|------------------------------|-----|--------|---------|---------|-----------|------------|------------|----------------|---------|----------|
| Sr No | Name of water resource | Location | pH | Ph- Al | Me O Al | TH mg/l | Ca-H mg/l | Mg- H mg/l | Car-H mg/l | Non-Car H mg/l | Cl mg/l | TDS mg/l |
| 1 | Open Well | Near Mahavir Park | 7.9 | Nil | 340 | 1160 | 250 | 910 | 340 | 820 | 530 | 2280 |
| 2 | Open Well | Near Mahavir Park | 7.4 | Nil | 320 | 1090 | 240 | 850 | 320 | 870 | 480 | 2070 |
| 3 | Open Well | Near Gurudwara Kabutar Sahib | 7.5 | Nil | 230 | 890 | 180 | 710 | 230 | 610 | 330 | 1900 |
| 4 | Hand Pump | Near Mahavir Park | 7.3 | Nil | 330 | 610 | 180 | 430 | 210 | 160 | 170 | 630 |
| 5 | Hand Pump | Near Gurudwara Sheen Talai | 7.4 | Nil | 349 | 660 | 190 | 470 | 180 | 170 | 190 | 580 |

pH levels in present study ranges from 7.3 to 7.9 which is in permissible limits of water for drinking purpose as well As for other uses. Phenolphthalein alkalinity in all the samples is reported nil whereas methyl orange alkalinity ranges from 230 to 349.

Total hardness total hardness in tested samples ranges from 610 mg per liter sample number 4 to 1160 mg per liter sample number 1 which proves that total hardness of all the samples can be considered as very hard it is advised that water having hardness above 200 mg per liter is not suitable for drinking purpose by human.

Calcium hardness parameter shows presence of calcium ions in water samples in present study, the lowest value of calcium hardness is 180 mg per liter in sample number 3 and 4 while highest is 250 mg per liter in sample number 1, this reveals that highest amount of calcium salts are present in sample number 1 and lowest amount in sample number 3 and 4.

Magnesium hardness estimation for water samples denotes presence of magnesium ions in the sample. In present investigation there is highest level of calcium hardness is 910 mg per liter in sample number 1 and lowest is 180 mg per liter in sample number 5 which again denotes that sample number 1 bears highest levels of magnesium salts.

Carbonate and non-carbonate hardness in tested samples lowest value of carbonate hardness is 180 mg per liter in sample number 5 and highest value is 870 mg per liter in sample number 2 in terms of non-carbonate hardness the lowest value is 160 mg per liter in sample number 4 and highest value is 820 mg per liter in sample number 1. All the values are higher as compared to permissible limits for drinking water.

Chloride contents estimation also represents the presence of various salts in water. In tested samples the lowest value is 170 mg per liter in sample number 4 and highest value is 530 mg per liter in sample number 1.

Total Dissolved Solids (TDS) is a general parameter tested for drinking water in present study the lowest TDS value is 380 mg per liter in sample number 4 and highest TDS value is 2280 mg per liter in sample number 1 which is very high in all the tested samples.

CONCLUSION

According to the above-mentioned parameters, most of the groundwater is not potable by humans but it can be used in other activities done by humans like cleaning, bathing and to some extent this water is also can be used for irrigation.

ACKNOWLEDGEMENTS

Author is thankful to geography faculty of Dyal Singh College, New Delhi to encourage for this research work. Author is also grateful to chemistry faculty of Gargi Kanya Mahavidyalaya, Nohar for providing immediate chemical testing facilities.

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