

Chemo Metric Analysis of Ground Water of Bathinda District

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ABSTRACT: The overall objective of this analysis was to determine the chemometric analysis of ground water of Bathinda District. Ground water samples were collected from different locations of Bathinda District. Ground water samples were collected from twenty location (viz Bhodipura, Adampura, Dialpura Bhai Ka, Bhagta Bhai Ka, Bhai Rupa, Gumti Kalan, Kalyan Sukha, Burj Mansa, Mehraj, Nathana, Janda wala, Goniana Mandi, Dann Singh Wala, Badiala, Gill Kalan, Lehra Mohabbat, Bhucho Mandi, Gobindpura, Sivian, Deon) of Bathinda District during the months of January and February 2015 and Ground Water samples were taken to the laboratory and analyzed. The analysis was done for the parameters like turbidity, color, taste & odour, pH, Total Dissolved Solids, Total Alkalinity, Total Hardness, Calcium, Magnesium, Chlorides, Sulphates, Fluorides, Nitrates, Iron, Residual Chlorine. The comparison of the physico-chemical parameters of the water samples with WHO limits, it was found that some of the samples were non-portable for human consumption due to high concentrations of certain parameters such as Calcium, Magnesium, Hardness, Fluorides and Total Dissolved Solids (TDS).

KEYWORDS: Ground water physical and chemical properties.

I. INTRODUCTION

Water is one of the basic necessities of mankind. It is a necessary input for all public economic and developmental activities. The status of water resource is related to the type of soil, vegetation cover, human actions and consumption pattern. Water is an only chemical composite on this planet that exists in solid, liquid and gaseous state. In nature it is found in oceans, rivers, lakes, glaciers etc. in and on land i.e. in terms of fresh water and ground water. Fresh water is regularly recharged through a process known as the hydrological cycle that controls the temporal and spatial distribution of water in the form of evaporation, transpiration, precipitation and runoff. The process through which ground water percolates down the soil to reach the optimum level or water table, either by natural or artificial processes is called ground water recharge. The quantity and the rate of groundwater recharge is naturally dependent on resourceful ground water management. Water is a key resource for Industrial and economic growth. Nearly 95% of rural residents rely on groundwater for their drinking water supply. The main source of irrigation in rural India still remains the ground water, it also accounts for approximately one third of industrial water needs. About 40% of river flow nationwide (on average) depends on groundwater. It also has an important role to play in supporting the natural systems.

Rainfall is the principal source groundwater recharge. Other sources include recharge from rivers, streams, irrigation water, etc. Moisture movement in the unsaturated zone is controlled by suction pressure, moisture content and hydraulic conductivity relationships. The amount of moisture that will ultimately reach the water table is defined as natural ground water recharge, which depends on the rate and time of rainfall, the succeeding conditions at the upper

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boundary, the antecedent soil humidity conditions, the water table depth and the soil type. Groundwater is an out of sight resource. At one time, it was considered an abundantly available resource and its availability and purity were taken for granted. However, today the main area of concern is pollution and unavailability. Scientists estimate groundwater accounts for more than 95% of all fresh water available for use

II. STUDY AREA

Bathinda is one of the historical and important towns of North India. It is associated with the imprisonment of Razia Sultan in the Fort, which is more than 1800 years old. According to Khalifa Muhammad Hassan, author of History of Patiala, its ancient name was Bikramgarh. According to Raverty, Bathinda was known as Tabarhindh (Labb-ut-Twarikh). According to Ibn Batuta it was known as Batrinda. The earliest mention of Tabarhindh occurs in the "Jami-Ul-Hakayat" written about 607 Hijri or 1211 AD. In recent times the town was conquered by Maharaja Ala Singh (near about 1754 AD) and since then it followed the history of erstwhile princely state of Patiala.

DATA SAMPLING LOCATIONS

SAMPLING LOCATION	SAMPLE CODIG
Bodhipura	S-1
Adampura	S-2
Dialpura Bhai Ka(Main)	S-3
Bhagta Bhai Ka	S-4
Bhai Rupa	S-5
Gumti Kalan	S-6
Kalyan Sukha	S-7
Burj Mansa	S-8
Mehraj	S-9
Nathana	S-10
Janda wala (Main)	S-11
Goniana Mandi	S-12
Dann Singh Wala	S-13
Badiala	S-14
Gill Kalan	S-15
Lehra Mohabbat	S-16
Bhucho Mandi	S-17
Gobindpura	S-18
Sivian	S-19
Deon	S-20

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OBSERVATIONS TABLE A

Parameters	S-1 Test Result	S-2 Test Result	S-3 Test Result	S-4 Test Result	S-5 Test Result	S-6 Test Result	S-7 Test Result	S-8 Test Result	S-9 Test Result	S-10 Test Result	Permissible Limits
Turbidity	0.26	0.56	0.70	0.68	0.34	0.80	0.72	0.72	0.40	0.70	1.00
Colour	Colourless	Colours	Colours	Colours	Colours	Colours	Colours	Colours	Colours	Colours	5
Taste & Odour	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Agreeable
pH	7.24	7.66	7.72	7.86	7.88	8.14	7.84	7.64	7.92	7.74	6.5-8.5
Total Dissolved Solids(mg/l)	48	524	206	664	36	1120	814	144	42	306	500
Total Alkalinity(CaCo3)mg/I	12	78	68	78	12	114	104	58	12	72	200
Total Hardness(CaCo3)mg/I	18	94	94	96	16	188	178	82	16	94	200
Calcium(Ca)mg/I	10	68	52	72	8	82	84	58	8	60	75
Magnesium(Mg)mg/I	8	22	24	24	6	36	40	16	6	22	30
Chlorides(CI)mg/I	8	56	68	64	6	94	82	48	10	76	250
Sulphates(SO4)mg/I	4	34	46	56	BDL	82	68	34	4	54	200
Flourides(F) mg/l	0.15	0.65	0.55	0.80	0.10	0.75	1.60	0.30	0.15	0.45	1.00
Nitrates(NC2)mg/I	BDL	12	12	14	BDL	20	18	10	BDL	10	45
Iron(Fe)mg/I	0.02	0.07	0.06	0.08	BDL	0.09	0.08	0.04	0.02	0.06	0.03

S- 1, 3, 5,7, 8, 9, 10 water was potable.

S-2 TDS factor was more

S-4 TDS factor was more

S-6 TDS, Calcium, Magnesium factor was more

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OBSERVATIONS TABLE B

Parameters	S-11 Test Result	S-12 Test Result	S-13 Test Result	S-14 Test Result	S-15 Test Result	S-16 Test Result	S-17 Test Result	S-18 Test Result	S-19 Test Result	S-20 Test Result	Permissible Limits
Turbidity	0.62	0.18	0.74	0.84	0.70	0.78	0.70	0.67	0.76	0.46	1.00
Colour	Colours	Colours	Colours	Colours	Colours	Colours	Colours	Colours	Colours	Colours	5
Taste & Odour	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Ordinary	Agreeable
pH	7.66	7.16	7.62	7.90	8.04	7.76	8.14	7.64	7.90	7.38	6.5-8.5
Total Dissolved Solids(mg/l)	135	28	136	837	604	564	1264	298	1206	124	500
Total Alkalinity(CaCo3)mg/I	40	8	56	114	82	92	106	60	112	36	200
Total Hardness(CaCo3)mg/I	58	12	74	206	142	144	224	84	244	42	200
Calcium(Ca)mg/I	30	6	42	92	68	74	98	56	94	26	75
Magnesium(Mg)mg/I	18	4	20	38	22	28	48	22	38	14	30
Chlorides(Cl)mg/I	34	BDL	52	84	88	82	90	36	88	20	250
Sulphates(SO4)mg/I	20	BDL	34	72	66	64	82	20	70	18	200
Flourides(F) mg/l	0.35	0.10	0.45	0.70	0.65	1.10	2.05	1.35	0.65	0.25	1.00
Nitrates(NC2)mg/I	6	BDL	10	18	12	14	28	16	10	4	45
Iron(Fe)mg/I	0.05	BDL	0.05	0.08	0.08	0.08	0.09	0.07	0.07	0.04	0.03

S-11, 12, 13, 17, 20 showed water was potable

S-14 TDS, Hardness, Calcium, Magnesium factor was more

S-15 TDS was more

S-16 TDS and Fluoride factor was more

S-18 Fluoride was more

S-19 TDS, Hardness, Calcium, Magnesium was more

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III. RESULTS AND DISCUSSION

In most of the water samples the **Turbidity** was found to be within the permissible range as prescribed by WHO. At all the sampling stations the turbidity values vary in the range of 0.18 JTU to 0.84 JTU. WHO has recommended maximum permissible limit of Colour from 5 to 15. At all the stations no **colour** was found. WHO has recommended maximum permissible limit of **pH** from 6.5 to 8.5. At all stations pH values were found in within desirable limits and suitable range. The pH of all stations was in the range of 7.16 to 8.14 and was found to be within the limit. TDS is the presence of dissolved solids and it indicates the behavior of salinity in the groundwater. Water containing more than 500 mg/L of TDS is not considered desirable for drinking water supplies, but in unavoidable cases 1500 mg/L is also allowed. TDS values varied between 26 mg/L to 1264 mg/L. The observation shows that the TDS is above the permissible range as prescribed by WHO (2004) in sample numbers [2,4,6,14,15,16,19]. **Total alkalinity** of water in terms of CaCO₃ varied from 10-112 mg/l. The water for domestic use having alkalinity less than 100mg/l is safe. The alkalinity of all water samples was within the desirable limit as prescribed by WHO. **Hardness** is the property of water which increases the boiling points of water. WHO has recommended maximum permissible limit of hardness between 200 to 600 mg/l. The hardness values obtained range from 12 mg/L to 224 mg/L. WHO has recommended maximum permissible limit of **calcium** between 75 to 100 mg/l. In the present study, the Calcium concentration ranged between 8mg/L to 98 mg/L. WHO has recommended maximum permissible limit of **Magnesium** between 30 to 100 mg/l. In the present study, the Magnesium concentration ranged between 4mg/l to 48mg/l. WHO has recommended maximum permissible limit of Chlorides from 250 to 1000 mg/l. In the present study, the **Chlorides** concentration ranged between 6mg/l to 98mg/l. WHO has recommended maximum permissible limit of **Sulphates** from 200 to 400 mg/l. In the present study, the Sulphates concentration ranged between 18 mg/l to 64 mg/l. WHO has recommended maximum permissible limit of **Fluorides** from 1.00 to 1.50 mg/l. In the present study, the Fluorides concentration ranged between 0.10mg/l to 2.05 mg/l. WHO has recommended maximum permissible limit of **Nitrates** from 45mg/l to no relaxation. In the present study, the Nitrates concentration ranged between 4mg/l to 28 mg/l and found within the limit prescribed by WHO. WHO has recommended maximum permissible limit of Iron between 0.03mg/l to 1.00mg/l. In the present study, the **Iron** concentration ranged between 0.04mg/l to 0.09 mg/l.

IV. CONCLUSIONS

Overall study carried out in the Bathinda District on ground water samples confirms that the ground water was not fit for drinking purposes and is required to be improved.

V. FUTURE SCOPE

1. Each and every property of water has its own impact on human's health. We can use the water according to the results.
2. Physical and chemical properties of water also affect the construction material like concrete, bricks, sand etc. After getting the results from testing now we can use the water in construction as per the conditions.
3. Properties of water can be improved by using various treatment methods in the areas where the results are very critical.
4. Properties of water also affect the agricultural production. This report also helps in improving the production of Agriculture

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