



PHYSICO-CHEMICAL PARAMETERS OF GROUND WATER FROM SELECTED STATIONS OF BABRA TALUKA OF AMRELI DISTRICT- GUJARAT

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ABSTRACT

*Drinking water is analysed in terms of Physico chemical parameters such as pH, Total dissolve solid (TDS), Total hardness, Total alkalinity, Chloride, Sulphate, Calcium, Magnesium, Nitrate values, Chemical oxygen demand (COD), Biological oxygen demand (BOD), Fluoride and Turbidity. Measurement is done for six stations of **Babra Taluka** of **Amreli** district. All the parameter measurements are made in terms of three different seasons such as WINTER, SUMMER and MONSOON. Results obtained are compared in terms of their highest value and lowest values among six stations in terms of 13 parameters.*

Keywords: Fluoride, COD, BOD, Calcium content, Ground water, Turbidity.

1. Introduction

In Ground and river water Concentration of ions, C.O.D, B.O.D. Dissolved oxygen (DO), Temperature pH, phosphate, total dissolved solid (T.D.S Nitrate values was found to be greater during time interval by 2 months was recorded. Surface water of Dahod region, Gujarat PH was generally measured in the range of 6.727.55 was recorded maximum parameter were not at level of Pollution. Life is possible because of water. Safe and clean water is dangerous for humanoid health & environment fitness. As initially 5000 year ago, federal organizations “Water is the driver of life”, said Leonardo da Vinci. Water is one of the most abundant substances on our planet. Our planet is a complex system of land, air and water. It is the only substances on the earth that exists in all the three states (solid, liquid and

gas) of matter [1]. Nobel laureate A.Szent-Gyogri has called "The Matrix of life" Water which maintains biologically active structure and it is now universally agreed that all life will perish without water. Some years ago, an engineer Thomson King epitomized the Water problem in the following words: "Of all the compounds that are required necessary to life as we know it on earth, water is by far the most important, the most familiar, and the most wonderful, yet most people know very little about it"[2]. History is replete with the sagas of armies that fought over water, of monarchs and priests who worshiped it and health workers who have blessed it, of civilizations that dwindled after losing or mismanaging it, of people who died because of it. Water is extraordinary [3]. Water is precious for life and food security, where erratic rainfall, declining resources and more withdrawals in the existing scenario force every human to use it more efficaciously. It is everywhere. It was estimated that world have about 400 million cubic kilometer of water and of this only 35 million cubic kilometer (2.5 percent) is fresh water, which is present in the form of ice-caps, glaciers and deep underground water [4]. The lost of Water was there when the earth was born, and it is believed by the scientists believe that life was conceived in the earth's initial oceans. Water continues to support all life – some very simple creatures can live without oxygen. But there were none which can develop without water [5]. It has played vital role in developing living and some time it has played a very dangerous role their end [6, 7, 8]. From above introductory part we have planned to analysed ground water of 06 stations of Babra taluka of Amreli district, Gujarat with respect to thirteen parameter such as pH, Total dissolve solid (TDS), Total hardness, Total alkalinity, Chloride, Sulphate, Calcium, Magnesium, Nitrate values, Chemical oxygen demand (COD), Biological oxygen demand (BOD), Fluoride and Turbidity in terms of WINTER, SUMMER and MONSOON seasons.

2. Materials and Methods

2.1 Chemicals and Reagents

All the reagents used are of AR grade and used without further purifications. Physico-chemical characterization of river, ground, and surface water such as p^H , Total dissolve solid (TDS), Total hardness, Total alkalinity, Chloride, Sulphate, Calcium, Magnesium, Nitrate values, Chemical oxygen demand (COD), Biological oxygen demand (BOD), Fluoride and Turbidity were carried out by following methods [9].

Sr. No.	Parameters of water analysis	Methods
1	p ^H	Digital P ^H Meter
2	Mg ⁺² , Ca ⁺² Hardness	Titration (EDTA-Titrimetric)
3	TDS & Total hardness	Digital TDS Meter
4	Total Alkalinity	Titrimetric using Indicators
5	Chloride	Argenometric
6	Phosphate	Spectrophotometric
7	Sulphate	Spectrophotometric
8	Nitrate	Spectrophotometric
9	COD & BOD	Open reflux method
10	F ⁻	Spectrophotometer

2.2 Experimental

2.2.1 Sampling

Samples will be collect in pre cleaned 2 litre polyethylene bottles. The sampling preservations and analysis of parameters (APHA, 1998) [9]. The water samples will be collected nearly from 6 stations of **Babra** Taluka. During the WINTER, SUMMER and MONSOON seasons. Physicochemical parameter such as pH, Temperature, Chloride, Sodium, Nitrate, Chloride content, Fluoride content, Sulphate content, Turbidity, COD and BOD etc will be planning to study (**Table 1-3**).

Table 1 Physico-chemical analysis of ground water of **Babra** taluka of **Amreli** district, Gujarat (WINTER).

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Amarvalpar	Barvala	Bhila	Chamardi	Charkha	Dharai
1	TDS	455	515	450	595	742	650
2	pH	6.90	7.45	7.65	7.20	7.91	7.93
3	T. Hardness	425	330	320	280	215	260
4	Ca ⁺²	61	34	29	43	31	58
5	Mg ⁺²	41	86	42	33	31	24
6	Cl ⁻¹	85	31	99	165	161	115
7	SO ₄ ⁻²	22	20	28	09	20	46
8	NO ₃ ⁻¹	15.86	12.42	16.99	20.40	7.0	8.5

9	F ⁻¹	0.2	0.3	0.4	0.9	1.3	0.1
10	Alkalinity	299	283	315	386	459	361
11	Turbidity	3.1	1.5	1.9	3.4	2.8	4.2
12	COD	13	10	7	8	13	16
13	BOD	6	10	11	6	2	3

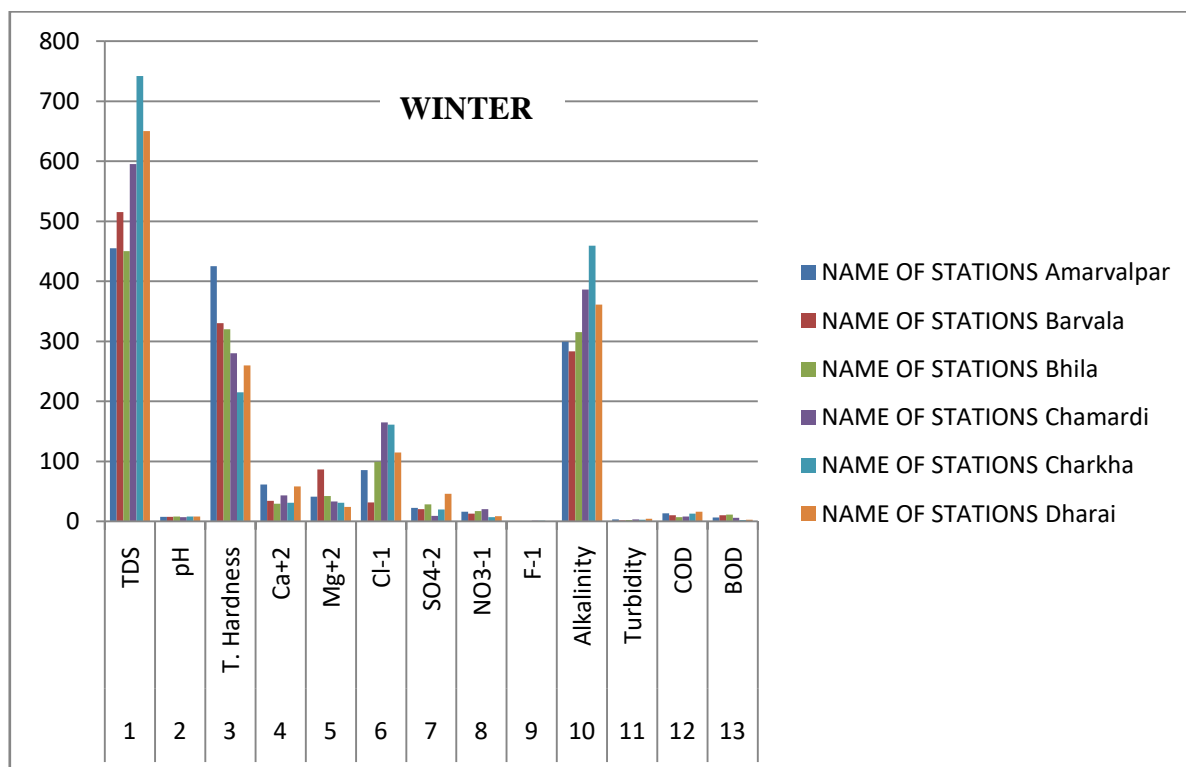


Figure 1 Physico-chemical parameter of ground water of **Babra** taluka (WINTER).

Table 2 Physico-chemical analysis of ground water of **Babra** taluka of **Amreli** district, Gujarat (SUMMER).

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Amarvalpar	Barvala	Bhila	Chamardi	Charkha	Dharai
1	TDS	369	510	427	745	742	368
2	pH	7.87	6.90	7.75	7.33	7.53	7.36
3	T. Hardness	423	436	315	220	223	256
4	Ca ⁺²	59	60	29	51	38	59
5	Mg ⁺²	35	84	41	32	19	23
6	Cl ⁻¹	82	27	99	99	163	110
7	SO ₄ ⁻²	26	19	28	10	31	14
8	NO ₃ ⁻¹	16.83	12.30	17.10	20.34	7.0	8.4

9	F ⁻¹	0.3	0.7	0.2	0.9	1.3	0.3
10	Alkalinity	221	291	315	385	460	357
11	Turbidity	3.1	2.0	1.9	3.2	2.8	3.5
12	COD	11	04	9	11	14	9
13	BOD	5	11	13	7	2	5

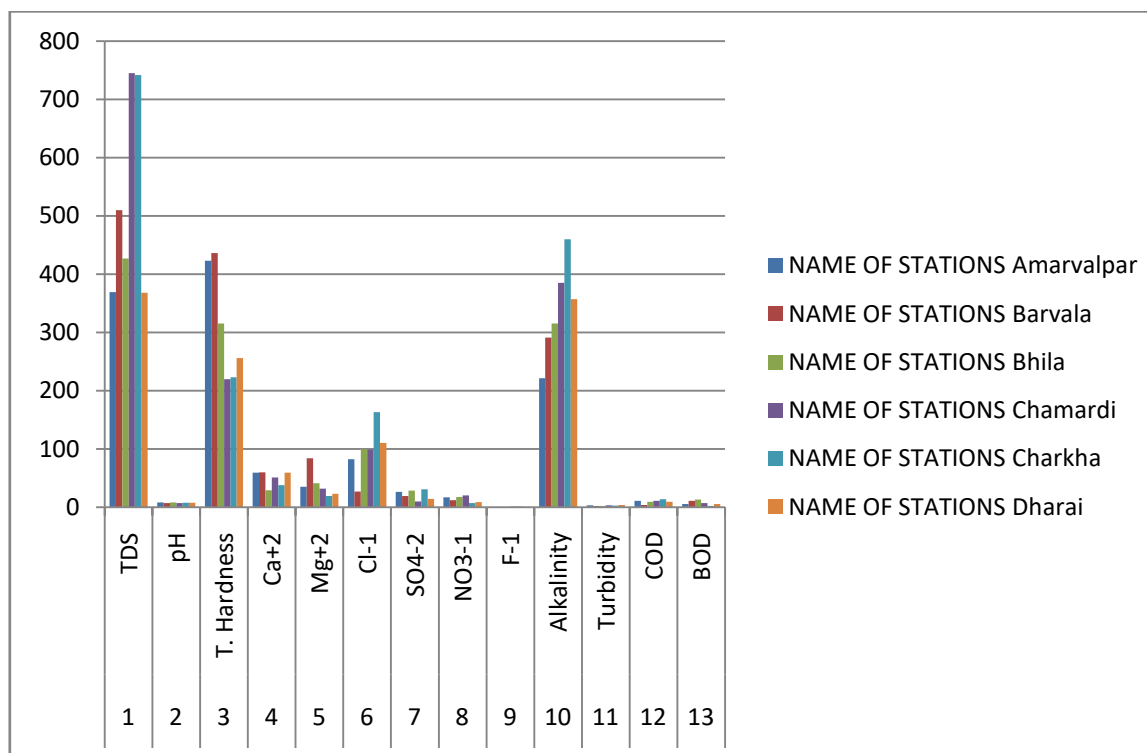


Figure 2Physico-chemical parameter of ground water of **Babra** taluka (SUMMER).

Table 3 Physico-chemical analysis of ground water of **Babra** taluka of **Amreli** district, Gujarat (MONSOON).

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Amarvalpar	Barvala	Bhila	Chamardi	Charkha	Dharai
1	TDS	561	722	589	623	779	530
2	pH	7.16	7.86	7.50	7.81	8.93	7.80
3	T. Hardness	250	215	435	310	246	214
4	Ca ⁺²	87	84	61	35	45	43
5	Mg ⁺²	41	21	37	65	73	45
6	Cl ⁻¹	111	142	118	122	28	70
7	SO ₄ ⁻²	23	38	40	45	46	28

8	NO ₃ ⁻¹	12.32	18.06	15.20	25.70	10.50	21.08
9	F ⁻¹	1.22	1.23	0.86	1.05	1.34	0.90
10	Alkalinity	310	236	345	214	369	285
11	Turbidity	3.6	3.9	3.5	4.0	1.2	1.4
12	COD	1.74	2.16	0.53	0.7	1.12	0.15
13	BOD	4	8	9	4	1	7

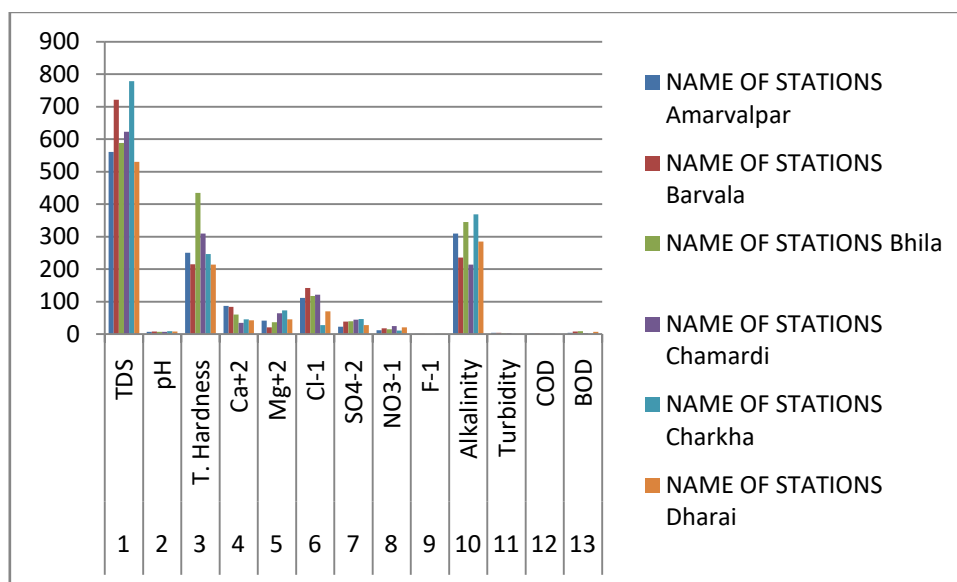


Figure 3 Physico-chemical parameter of ground water of **Babra** taluka (MONSOON).

3. Result and Discussion

Maximum and minimum values of parameters of ground water quality of **Babra** taluka of Amreli district, Gujarat. Standard values of parameters [18] are also given with each parameter.

3.1 TDS

All the minerals, salts and non volatile inorganic impurities are termed as Total dissolved Solid. WHO in 1993 has specified upper limit of TDS as 1000mg/l. higher level of TDS may cause kidney dysfunction like stone, calcium deposition in renal system. Here in the present study the TDS ranges from 200-6000 mg/l.

WINTER Season shows highest value at **Charkha** and lowest value at **Bhila**.

SUMMER Season shows highest value at **Chamardi** and lowest at **Amarvalpar**.

MONSOON Season shows highest value at **Charkha** and lowest at **Dharai**.

3.2 pH

This parameter tells about the presence of acid or alkali in water. As per the WHO the acceptable limit for potable water is 6.5-8.5.

WINTER Season shows highest value at **Dharai** and lowest value at **Amarvalpar**.

SUMMER Season shows highest value at **Bhila** and lowest at **Barvala**.

MONSOON Season shows highest value at **Charkha** and lowest at **Amarvalpar**.

3.3 Total Hardness

Its comprises the total hardness of water along with Ca^{+2} and Mg^{+2} . As per the WHO the acceptable limit for potable water is 300 mg/l. Its higher value causes varied consequences but depending in the values of Ca^{+2} and Mg^{+2} hardness.

WINTER Season shows highest value at **Amarvalpar** and lowest value at **Charkha**.

SUMMER Season shows highest value at **Barvala** and lowest at **Chamardi**.

MONSOON Season shows highest value at **Bhila** and lowest value at **Dharai**.

3.4 Calcium content

Calcium is necessary in the body for healthier bone but under specified limit it is beneficiary or else excess of calcium can cause Kidney stone/bladder. As per the WHO the acceptable limit for potable water is 75-200 mg/l.

WINTER Season shows highest value at **Amarvalpar** and lowest value at **Bhila**.

SUMMER Season shows highest value at **Barvala** and lowest at **Bhila**.

MONSOON Season shows highest value at **Amarvalpar** and lowest at **Chamardi**.

3.5 Mg^{+2} content

Magnesium is necessary in the body for healthier digestion Magnesium above specified limit cause Gastro intestinal irritation in presence of sulphate ion. WHO the acceptable limit for potable water is 50-100 mg/l.

WINTER Season shows highest value at **Barvala** and lowest value at **Dharai**.

SUMMER Season shows highest value at **Barvala** and lowest at **Charkha**.

MONSOON Season shows highest value at **Charkha** and lowest at **Barvala**.

3.6 Chloride content

Almost all water bodies contain chloride. Even common salt contain more than 50% of Chloride. Excess of Chloride cause the séance toward its taste, also the Laxative effect, Heart and Kidney diseases. According to WHO the acceptable limit for potable water is up to 250 mg/l.

WINTER Season shows highest value at **Chamardi** and lowest value at **Barvala**.

SUMMER Season shows highest value at **Charkha** and lowest at **Barvala**.

MONSOON Season shows highest value at **Barvala** and lowest at **Charkha**.

3.7 SO₄⁻² content

Sulphate has very less effect on the taste of water as compare to chloride. The desirable limit of drinking water prescribed by WHO is 200-400 mg/l. The content higher than specified limit causes diarrhoea and intestinal disorders.

WINTER Season shows highest value at **Dharai** and lowest value at **Chamardi**.

SUMMER Season shows highest value at **Charkha** and lowest at **Chamardi**.

MONSOON Season shows highest value at **Charkha** and lowest at **Amarvalpar**.

3.8 NO₃⁻ content

Though the nitrate is combined form of nitrogen which is essential for healthy growth of plant Kingdom but its nitrate form may cause Diarrhea in child and adult where as when the water use to prepare baby food is having nitrate content more than specified limit it cause Blue baby syndrome. The desirable limit of drinking water prescribed by WHO is up to 45 mg/l.

WINTER Season shows highest value at **Chamardi** and lowest value at **Charkha**.

SUMMER Season shows highest value at **Chamardi** and lowest at **Charkha**.

MONSOON Season shows highest value at **Chamardi** and lowest at **Charkha**.

3.9 Fluoride content

Numerous of minerals are found as fluoride salts which make it soluble. It is necessary in certain limit because beyond that it cause fluorosis, porous bone etc. Desirable limit of Fluoride content in potable drinking water as prescribed by WHO is 0.6-1.2 mg/l.

WINTER Season shows highest value at **Charkha** and lowest value at **Dharai**.

SUMMER Season shows highest value at **Charkha** and lowest at **Bhila**.

MONSOON Season shows highest value at **Charkha** and lowest at **Bhila**.

3.10 Alkalinity

It's a combined property of water that it content carbonate and hydroxide. In other terms it can be said that ability to neutralize acid. Maximum permissible limit as prescribed by WHO is 600 mg/l.

WINTER Season shows highest value at **Charkha** and lowest value at **Barvala**.

SUMMER Season shows highest value at **Charkha** and lowest at **Amarvalpar**.

MONSOON Season shows highest value at **Charkha** and lowest at **Chamardi**.

3.11 Turbidity

Desirable limit is Up to 10NTU.

WINTER Season shows highest value at **Dharai** and lowest value at **Barvala**.

SUMMER Season shows highest value at **Dharai** and lowest at **Bhila**.

MONSOON Season shows highest value at **Chamardi** and lowest at **Charkha**.

3.12 COD

It is a measure of the required oxygen for the oxidation of organic matter. It is the most essential property of the water. Generally the ground water have dissolve oxygen value 4.2 mg/l to 6.0 mg/l. WHO recommends the water having DO value greater than 3mg/l as potable water. Water saturated with oxygen gives a pleasant taste. Water with DO less than specified limit may prove to be fetal for aquatic Kingdom.

WINTER Season shows highest value at **Dharai** and lowest value at **Bhila**.

SUMMER Season shows highest value at **Charkha** and lowest at **Barvala**.

MONSOON Season shows highest value at **Barvala** and lowest at **Bhila**.

3.13 BOD

Biochemical Oxygen Demand (BOD) reflects the value of oxygen required to oxidize organic waste in water using bacteria and/or protozoa. In case of high BOD levels the value of DO decreases. Nitrates, phosphates salts in water increases the chances for plant Kingdom to survive as a result of which the BOD value increases and DO decreases. WHO recommends the water having BOD value up to 30mg/L as potable water.

WINTER Season shows highest value at **Bhila** and lowest value at **Charkha**.

SUMMER Season shows highest value at **Bhila** and lowest at **Charkha**.

MONSOON Season shows highest value at **Bhila** and lowest at **Charkha**.

4. Conclusion

Physicochemical parameter such as, P^H , Total dissolve solid (TDS), Total hardness, Total alkalinity, Chloride, Sulphate, Calcium, Magnesium, Nitrate values, Chemical oxygen demand (COD), Biological oxygen demand (BOD), Fluoride and Turbidity are varied according to season so season play an important role in the quality of water. All the parameters were measure in terms of WINTER, SUMMER and MONSOON season.

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