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## PHYSICO-CHEMICAL PARAMETERS OF GROUND WATER FROM SELECTED STATIONS OF DHRANGADHRA TALUKA OF SURENDRANAGAR DISTRICT-GUJARAT

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### ABSTRACT

*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 are measured and analysed for six station of Dhrangadhra Taluka of Surendranagar 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:** Ground water, COD, BOD, Calcium content, Turbidity.

### 1. Introduction

In Ground and river water Concentration of ions, C.O.D, B.OD. 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 [1]. 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 [2]. Life is possible because of water. Safe and clean

water is dangerous for humanoid health & environment fitness. As initially 5000 year ago, federal organizations applied drinking rainwater to populations in amounts of the Mid East [3]. 2500 years ago, Athens, Greece reconstructed its metropolitan with cesspits that in seventh heaven hygienic surplus to pastoral areas for dumping onto groves and cultivated fields [4]. In the periods after, these binary facilities source of eating water & disposal of waste water have developed inherent everyday jobs of societies universal [5]. Pollution of water is an increasing problem in many parts of India. This problem is due to the scarcity of ground water recourses. This is also connected with a significant problem. That is the increment in water deem and day by day and also reduction in recharge of ground water. From chagement in the use of land, Joints to further compound the problem [6, 7]. The goal mouth of effort is to magistrare the crushed water excellence in Pengyang country founded on better water excellence in directory. An evidence entropy procedure was documented to allocate weight to every factore [8, 9]. For evaluating WQI & judge ground water excellence entire 74 ground water compounds out of 127 compounds were composed & all the substances exposed to all-inclusive physicochemical breakdown. All he crushed water tasters were considered for 13 constraints & for multiplying WQI 13 factors were designated overing them. Chloride, pH, chemical oxygen demand, sulfate, TH, nitrate, TDS, fluoride, free carbon dioxide and phosphate [10]. Data of entropy weight marks WQI seamless & makes the decision more realistic. The WQI for 74 compounds from 12.40 to 205.24 & more than 90 % of the compounds are under 100. The good quality water villages including more than 90 % of whole tertiary. The up digits WQI is deteced very much joined with the higher values of sulphate, TDS, chloride, TH, and nitrate [11]. In the medium characteristics of water area & poor quality water area. About water requires few degree of action earlier applications. From ground water gathering belvedere the ground water till required defense & long period of unevenness. Seeing possible future of quick industrial progress [12] as well as defensive ladders of agricultural non paint contaminated in the level area to be considered as an important issue [13]. In past 20 years and the western cost of India in Gujarat various types of ground water pollution problems have come out [14]. High salinity, Fluoride, nitrate and pollution from industrial has caused water pollution in different areas of the state [15]. The Mahi right bank command water is the sough tern tip of the arravalli North Gujarat water area. The drinking water necessity of Anand and kheda district that over lay this aquifer is dependent mainly a ground water. The village areas are mostly dependent on Panchayat managed water supply system dually joined personal and government hand pumps. A part from government water supply by pipes in some villages [16]. There is a little awareness of

purity of water barn despises, especially during the man's on. There are few NGO like IWMI, FES and some medical organization took initiative to assess the extent of biological contamination of well water after heavy rain in July 2006, and provides water clearing awareness among the people. To follow proper treatment to processor. Well water event room very deep level was highly contaminated till a period of week after heavy rain [17]. A part from such incidental problems in parity of water, there are significant I anger term problems that arrives from the use of fertilizers informs. Our present work have importance is to overcome the problems arises due to polluted water. From above introductory part we have planned to analysed ground water of 06 stations of Dhrangadhra taluka of Surendranagar 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 [11].

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

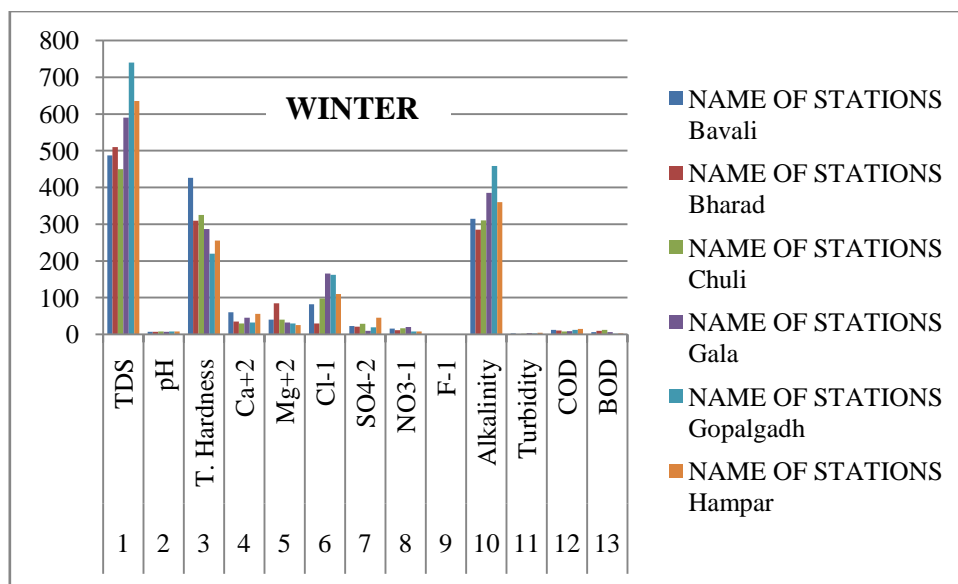
## 2.2 Experimental

### 2.2.1 Sampling

Samples will be collect in pre cleaned 2 litre polyethylene bottles. The sampling preservations and analysis of parameters (APHA, 1998) [18]. The water samples will be collected nearly from 6 stations of **Dhrangadhra** 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** Physico-chemical analysis of ground water of **Dhrangadhra** taluka of **Surendranagar** district, Gujarat (WINTER).

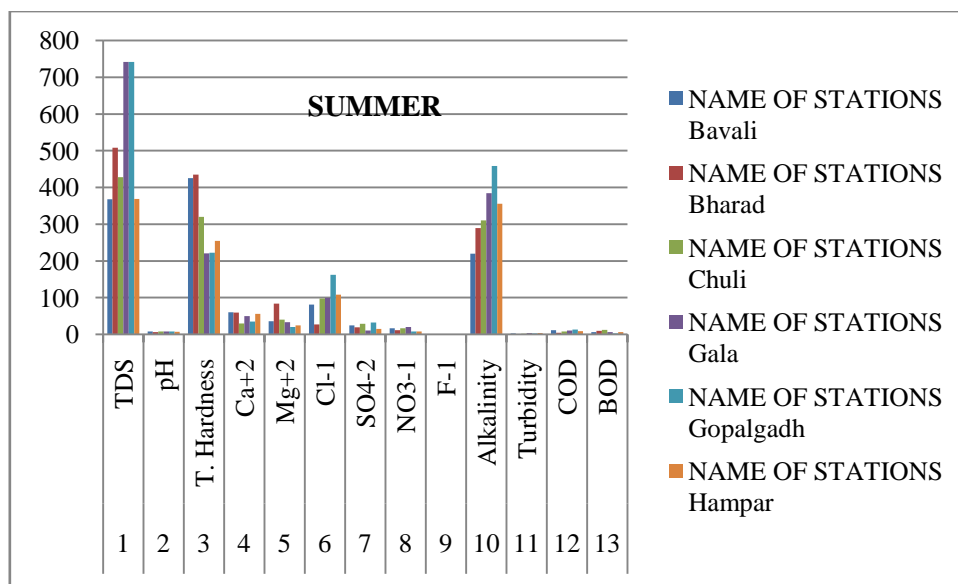
SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Bavali	Bharad	Chuli	Gala	Gopalgadh	Hampar
1	TDS	487	510	<b>450</b>	590	<b>740</b>	635
2	pH	<b>6.89</b>	7.45	7.70	7.30	7.81	<b>7.83</b>
3	T. Hardness	<b>426</b>	310	325	287	<b>220</b>	255
4	Ca <sup>+2</sup>	<b>60</b>	35	<b>30</b>	45	32	56
5	Mg <sup>+2</sup>	40	<b>85</b>	40	32	30	<b>25</b>
6	Cl <sup>-1</sup>	82	<b>30</b>	98	<b>166</b>	162	110
7	SO <sub>4</sub> <sup>-2</sup>	23	21	29	<b>10</b>	19	<b>45</b>
8	NO <sub>3</sub> <sup>-1</sup>	15.84	12.15	17.05	<b>20.33</b>	<b>8.0</b>	8.2
9	F <sup>-1</sup>	0.2	0.4	0.2	0.9	<b>1.2</b>	<b>0.1</b>
10	Alkalinity	315	<b>285</b>	310	385	<b>458</b>	360
11	Turbidity	3.2	<b>1.6</b>	1.8	3.2	2.7	<b>4.31</b>
12	COD	12	11	<b>8</b>	9	12	<b>15</b>
13	BOD	6	10	<b>12</b>	6	<b>2</b>	3



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

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

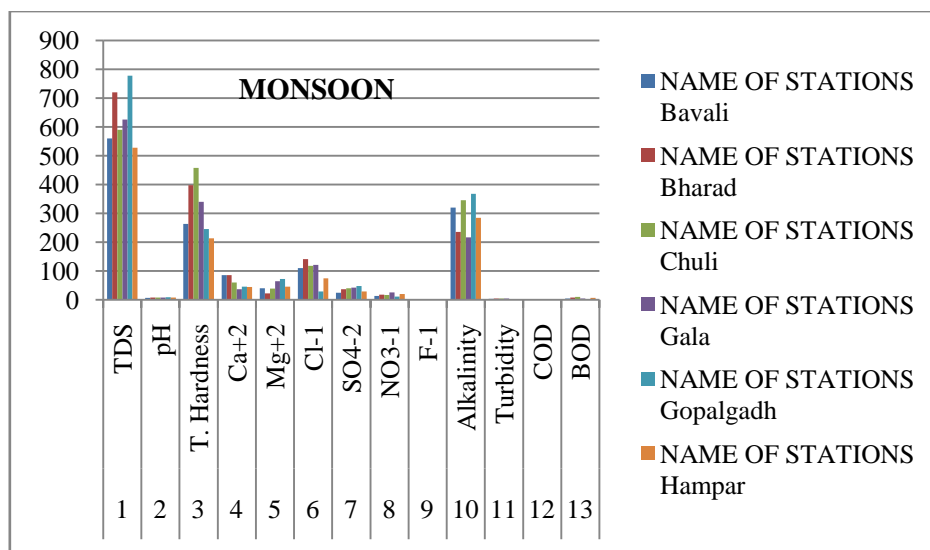
SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Bavali	Bharad	Chuli	Gala	Gopalgadh	Hampar
1	TDS	<b>368</b>	508	428	<b>742</b>	742	369
2	pH	7.88	<b>6.95</b>	<b>7.72</b>	7.35	7.54	7.35
3	T. Hardness	425	<b>435</b>	320	<b>220</b>	222	255
4	Ca <sup>+2</sup>	60	<b>60</b>	<b>30</b>	50	35	56
5	Mg <sup>+2</sup>	36	<b>84</b>	40	33	<b>20</b>	25
6	Cl <sup>-1</sup>	81	<b>28</b>	98	99	<b>162</b>	108
7	SO <sub>4</sub> <sup>-2</sup>	25	20	29	<b>10</b>	<b>32</b>	15
8	NO <sub>3</sub> <sup>-1</sup>	16.84	12.20	17.05	<b>20.33</b>	<b>8.0</b>	8.3
9	F <sup>-1</sup>	0.3	0.6	<b>0.2</b>	0.8	<b>1.2</b>	0.3
10	Alkalinity	<b>220</b>	290	310	384	<b>458</b>	356
11	Turbidity	3.2	1.9	<b>1.8</b>	3.1	2.7	<b>3.4</b>
12	COD	12	<b>05</b>	8	10	<b>13</b>	9
13	BOD	6	10	<b>12</b>	6	<b>3</b>	6



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

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

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Bavali	Bharad	Chuli	Gala	Gopalgadh	Hampar
1	TDS	560	720	590	625	<b>778</b>	<b>528</b>
2	pH	<b>7.17</b>	7.85	7.50	7.82	<b>8.92</b>	7.84
3	T. Hardness	263	398	<b>458</b>	340	246	<b>214</b>
4	Ca <sup>+2</sup>	<b>86</b>	85	60	<b>36</b>	46	45
5	Mg <sup>+2</sup>	40	<b>22</b>	38	64	<b>72</b>	46
6	Cl <sup>-1</sup>	110	<b>141</b>	117	121	<b>29</b>	75
7	SO <sub>4</sub> <sup>-2</sup>	<b>24</b>	37	39	42	<b>48</b>	29
8	NO <sub>3</sub> <sup>-1</sup>	13.31	18.12	16.21	<b>24.72</b>	<b>11.52</b>	20.33
9	F <sup>-1</sup>	1.20	1.22	<b>0.87</b>	1.03	<b>1.33</b>	0.95
10	Alkalinity	320	236	345	<b>216</b>	<b>368</b>	284
11	Turbidity	3.6	3.9	3.5	<b>4.0</b>	<b>1.2</b>	1.4
12	COD	1.74	<b>2.16</b>	<b>0.53</b>	0.7	1.12	0.15
13	BOD	4	8	<b>9</b>	4	<b>1</b>	7



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

### 3. Result and Discussion

Maximum and minimum values of parameters of ground water quality of **Dhrangadhra** taluka of Surendranagar 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 **Gopalgadh** and lowest value at **Chuli**.

SUMMER Season shows highest value at **Gala** and lowest at **Bavali**.

MONSOON Season shows highest value at **Gopalgadh** and lowest at **Hampar**.

#### 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 **Hampar** and lowest value at **Bavali**.

SUMMER Season shows highest value at **Chuli** and lowest at **Bharad**.

MONSOON Season shows highest value at **Gopalgadh** and lowest at **Bavali**.

### 3.3 Total Hardness

It comprises the total hardness of water along with  $\text{Ca}^{+2}$  and  $\text{Mg}^{+2}$ . 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  $\text{Ca}^{+2}$  and  $\text{Mg}^{+2}$  hardness.

WINTER Season shows highest value at **Bavali** and lowest value at **Gopalgadh**.

SUMMER Season shows highest value at **Bharad** and lowest at **Gala**.

MONSOON Season shows highest value at **Chuli** and lowest value at **Hampar**.

### 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 **Bavali** and lowest value at **Chuli**.

SUMMER Season shows highest value at **Bharad** and lowest at **Chuli**.

MONSOON Season shows highest value at **Bavali** and lowest at **Gala**.

### 3.5 $\text{Mg}^{+2}$ 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 **Bharad** and lowest value at **Hampar**.

SUMMER Season shows highest value at **Bharad** and lowest at **Gopalgadh**.

MONSOON Season shows highest value at **Gopalgadh** and lowest at **Bharad**.

### 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 **Gala** and lowest value at **Bharad**.

SUMMER Season shows highest value at **Gopalgadh** and lowest at **Bharad**.

MONSOON Season shows highest value at **Bharad** and lowest at **Gopalgadh**.

### 3.7 $\text{SO}_4^{-2}$ 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 **Hampar** and lowest value at **Gala**.

SUMMER Season shows highest value at **Gopalgadh** and lowest at **Gala**.

MONSOON Season shows highest value at **Gopalgadh** and lowest at **Bavali**.

### 3.8 $\text{NO}_3^-$ 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 **Gala** and lowest value at **Gopalgadh**.

SUMMER Season shows highest value at **Gala** and lowest at **Gopalgadh**.

MONSOON Season shows highest value at **Gala** and lowest at **Gopalgadh**.

### 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 **Gopalgadh** and lowest value at **Hampar**.

SUMMER Season shows highest value at **Gopalgadh** and lowest at **Chuli**.

MONSOON Season shows highest value at **Gopalgadh** and lowest at **Chuli**.

### 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 **Gopalgadh** and lowest value at **Bharad**.

SUMMER Season shows highest value at **Gopalgadh** and lowest at **Bavali**.

MONSOON Season shows highest value at **Gopalgadh** and lowest at **Gala**.

### 3.11 Turbidity

Desirable limit is Up to 10NTU.

WINTER Season shows highest value at **Hampar** and lowest value at **Bharad**.

SUMMER Season shows highest value at **Hampar** and lowest at **Chuli**.

MONSOON Season shows highest value at **Gala** and lowest at **Gopalgadh**.

### 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 fatal for aquatic Kingdom.

WINTER Season shows highest value at **Hampar** and lowest value at **Chuli**.

SUMMER Season shows highest value at **Gopalgadh** and lowest at **Bharad**.

MONSOON Season shows highest value at **Bharad** and lowest at **Chuli**.

### 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 **Chuli** and lowest value at **Gopalgadh**.

SUMMER Season shows highest value at **Chuli** and lowest at **Gopalgadh**.

MONSOON Season shows highest value at **Chuli** and lowest at **Gopalgadh**.

## 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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