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Physico-Chemical Parameters of Ground Water from Selected Stations of Wadhvan 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 Wadhvan 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.

KEY WORDS: Ground water, COD, BOD, Calcium content, Turbidity.

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Water is very useful of human life. Life is impossible without water. It plays a key role in a control of climatic conditions. Everything originated in the water and everything is sustained by water. The water in the seas absorbs or releases heat and help to maintain the atmospheric temperature by keeping it cool or warm. All life and peripheral activities are ceased without water. Water used in additional to drinking and personal hygiene water is needed for agriculture, industrial and manufacturing process hydroelectric power generation and production of electricity recreation and wild life etc. all peripheral and totally life cycle are ceased without water plays a key hole in a control of climatic condition¹. Climatic factor is physical forces and material factors related to a real environment. Usually man depends upon fresh water and ground water is fresh water. The earth depends mainly on rain to maintain the quantity of fresh water irregularities in rainfall to either floods or drought causing disaster. Fresh water is a key factor in lives of man and other living organisms. When a resource used for so many diverse purpose it is important that it can be developed and used rationally and efficiently².

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1 INTRODUCTION:

Some parts of our country have good resource of water while in other pats. There is a shortage of water the regions having good availability of water and flourishing because they have good crops but the regions having shortage of water are facing poverty because poor crop growth. It is therefore necessary to have a proper

management system so that there is a uniform distribution of water to all the regions. There are three sources of fresh water³.

- I. The rain fall
- II. River streams

III. Ground water

Rain water is available in monsoon only. As monsoon last for a few months most of the rain water lasts for a few months only. This rain water fills lakes and ponds and also flows into rivers some rain water also percolates into ground water became available as ground water. Rain water is stored in lakes for use our long period of time. There are many natural lakes in our country but in order to meet the increasing demand of fresh water many artificial lakes are made⁴.

Rivers are another important source of water. In our country rivers flow across diverse regions. Some of these rivers are large and are permanently filled with water. Rivers get their water supply from the melting of snow lying on the peaks of Snow Mountains⁵.

The water inside the soil is called groundwater. This water which has percolated deep into the ground is clean. We are at presents utilizing nearly 25% ground water. Most of it is used in agriculture. The availability of this water is decreasing due to its overuse and deposition of salts and pollutants in it. 71% of the earth's surface is covered by water earth's surface water is held in two different kind of water bodies i.e., salt water bodies and fresh water bodies. Fresh water is defined as water that contains less than 0.5 ppt of dissolved salt. The addition of various kind of pollutants and nutrients through the agency sewage, industrial, effluents, agriculture run of etc. into the water bodies bring about a series of change in the physico-chemical and characteristics of water which have been the subject of several investigation⁶.

Ground water is one of the source of drinking water supply in our country. Urban and rural area in India are mainly dependent on ground water. Water irrigation facilities are city area not a rural area is used for drinking water is source of the well and tube well. And clean and free from pollution than surface water⁷.

Clean and fresh water quality is good for health of human body. Ground water is the only one source of safe and good water. But ground water contains many solids and heavy metals in trace amount. This water is dangerous to human health and cause disease such as various cancers, paralysis, neurological, disorder, nerve damage, thyroid problems, liver damage, kidney problems, cardio-vascular disorder finger nail loss, diarrhoea, hair loss, mottle teeth, lung irritation and so many diseases are human body⁸.

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 **Wadhvan** taluka- **Surendranagar**, 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

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.

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 (APHA1998). The water samples will be collected nearly from 06 stations of Wadhvan Taluka of Surendranagar district. 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 **Wadhvan** taluka of **Surendranagar** district, Gujarat (winter).

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		ADHELI	ANINDRA	BALA	GOMTA	KATUDA	KHARVA
1	TDS	480	510	440	600	735	620
2	pH	6.10	7.41	7.94	7.42	7.82	7.86
3	T. Hardness	425	318	342	279	227	262
4	Ca ⁺²	62	37	35	50	34	51
5	Mg ⁺²	38	89	35	32	28	22
6	Cl ⁻¹	82	30	98	168	165	110
7	SO ₄ ⁻²	21	21	29	10	16	43
8	NO ₃ ⁻¹	42.90	13.14	18.09	21.33	8.1	8.4
9	F ⁻¹	0.4	0.7	0.4	0.7	1.2	0.2
10	Alkalinity	313	289	310	382	457	353
11	Turbidity	3.4	1.3	1.7	2.9	2.6	4.2
12	COD	14	11	10	11	12	16
13	BOD	6	9	11	4	2	5

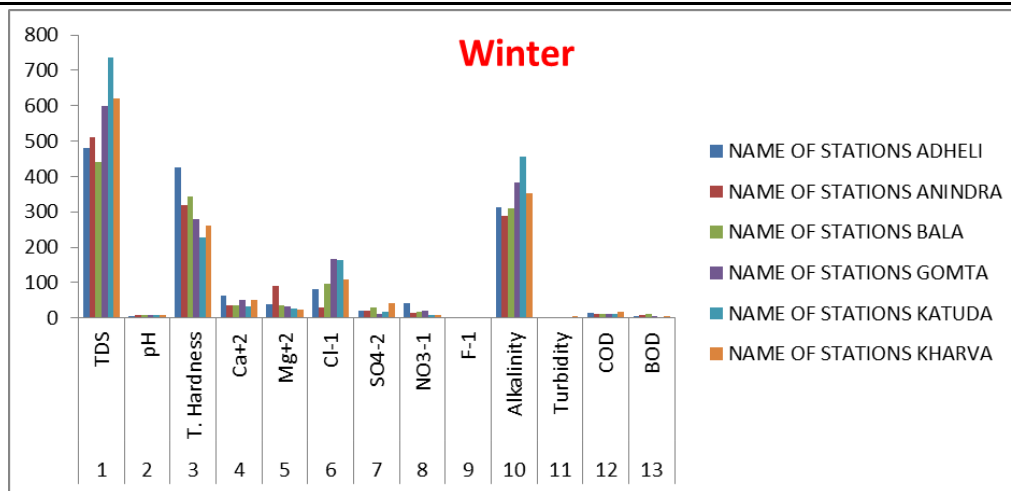


Figure 1 Physico-chemical parameter of ground water of **Wadhvan** taluka (Winter).

Table 2 Physico-chemical analysis of ground water of Wadhvan taluka of Surendranagar district, Gujarat (Summer).

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		ADHELI	ANINDRA	BALA	GOMTA	KATUDA	KHARVA
1	TDS	423	342	392	660	490	515
2	pH	7.82	6.94	7.86	7.80	7.14	7.10
3	T. Hardness	169	215	230	330	282	224
4	Ca ⁺²	26	52	46	75	62	58
5	Mg ⁺²	30	17	25	37	34	20
6	Cl ⁻¹	73	43	53	145	80	52
7	SO ₄ ⁻²	30	22	21	31	28	25
8	NO ₃ ⁻¹	13.98	10.44	0.62	38.57	22.16	9.12
9	F ⁻¹	1.77	0.26	1.48	1.11	0.48	0.52
10	Alkalinity	282	305	345	218	292	272
11	Turbidity	2.7	1.5	2.9	2.4	1.8	3.6
12	COD	12	9	8	13	16	11
13	BOD	5	7	8	3	1	4

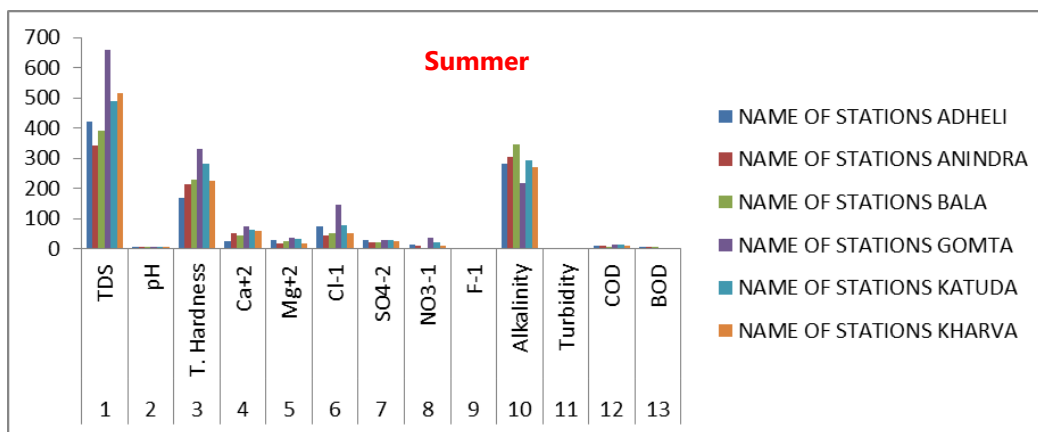


Figure 2 Physico-chemical parameter of ground water of Wadhvan taluka (Summer).

Table 3 Physico-chemical analysis of ground water of Wadhvan taluka of Surendranagar district, Gujarat (Monsoon).

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		ADHELI	ANINDRA	BALA	GOMTA	KATUDA	KHARVA
1	TDS	570	720	590	630	777	530
2	pH	7.85	7.20	7.53	7.82	7.85	8.92
3	T. Hardness	262	398	345	455	218	245
4	Ca ⁺²	45	83	59	85	38	46
5	Mg ⁺²	40	48	37	65	74	23
6	Cl ⁻¹	106	141	117	121	27	78
7	SO ₄ ⁻²	21	37	39	41	48	27
8	NO ₃ ⁻¹	12.32	44.30	15.60	23.80	11.49	21.35
9	F ⁻¹	1.27	1.20	0.90	1.04	1.34	0.96
10	Alkalinity	341	237	349	217	367	285
11	Turbidity	3.2	3.7	3.4	4.1	1.3	1.5
12	COD	1.78	2.18	0.52	0.70	1.14	0.16
13	BOD	4	8	14	7	3	7

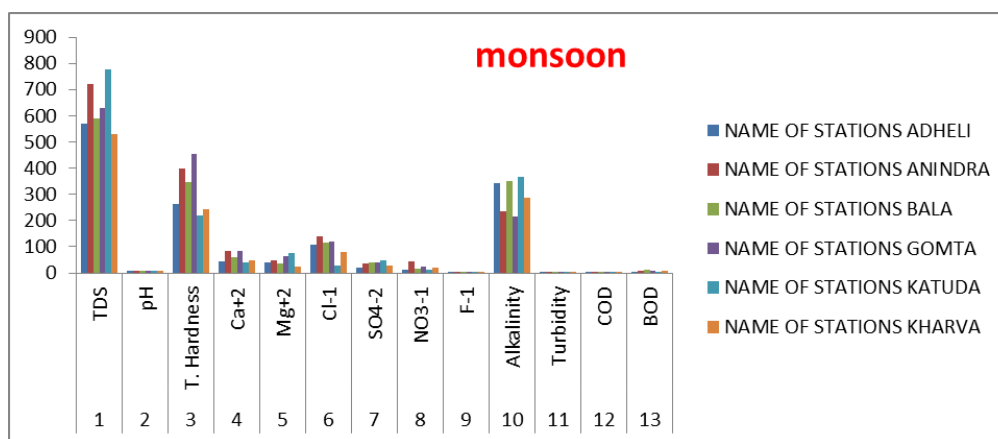


Figure 3 Physico-chemical parameter of ground water of Wadhvan taluka (Monsoon).

3. RESULT AND DISCUSSION

Maximum and minimum values of parameters of ground water quality of Wadhvan taluka of Surendranagar district, Gujarat

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 KHARVA and lowest value at ADHELI.

Summer Season shows highest value at GOMTA and lowest at ANINDRA.

Monsoon Season shows highest value at KATUDA and lowest at KHARVA.

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 BALA and lowest value at ADHELI.

Summer Season shows highest value at BALA and lowest at ANINDRA.

Monsoon Season shows highest value at KHARVA and lowest at ANINDRA.

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 dazed consequences but depending in the values of Ca^{+2} and Mg^{+2} hardness.

Winter Season shows highest value at ADHELI and lowest value at KATUDA.

Summer Season shows highest value at GOMTA and lowest at ADHELI.

Monsoon Season shows highest value at GOMTA and lowest value at KATUDA.

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 ADHELI and lowest value at KATUDA.

Summer Season shows highest value at GOMTA and lowest at ADHELI.

Monsoon Season shows highest value at GOMTA and lowest at KATUDA.

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 ANINDRA and lowest value at KHARVA.

Summer Season shows highest value at GOMTA and lowest at ANINDRA.

Monsoon Season shows highest value at KATUDA and lowest at KHARVA.

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 GOMTA and lowest value at ANINDRA.

Summer Season shows highest value at GOMTA and lowest at ANINDRA.

Monsoon Season shows highest value at ANINDRA and lowest at KATUDA.

3.7 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 KHARVA and lowest value at GOMTA.

Summer Season shows highest value at GOMTA and lowest at BALA.

Monsoon Season shows highest value at KATUDA and lowest at ADHELI.

3.8 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 ADHELI and lowest value at KATUDA.

Summer Season shows highest value at GOMTA and lowest at BALA.

Monsoon Season shows highest value at ANINDRA and lowest at KATUDA.

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 Hindoliya and lowest value at Bara.

Summer Season shows highest value at ADHELI and lowest at ANINDRA.

Monsoon Season shows highest value at KATUDA and lowest at BALA.

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 KATUDA and lowest value at ANINDRA.

Summer Season shows highest value at BALA and lowest at GOMTA.

Monsoon Season shows highest value at KATUDA and lowest at GOMTA.

3.11 Turbidity

Desirable limit is Up to 10NTU.

Winter Season shows highest value at ADHELI and lowest value at ANINDRA.

Summer Season shows highest value at KHARVA and lowest at ANINDRA.

Monsoon Season shows highest value at GOMTA and lowest at KATUDA.

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 KHARVA and lowest value at BALA.

Summer Season shows highest value at KATUDA and lowest at BALA.

Monsoon Season shows highest value at ANINDRA and lowest at KHARVA.

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 BALA and lowest value at KATUDA.

Summer Season shows highest value at BALA and lowest at KATUDA.

Monsoon Season shows highest value at BALA and lowest at KATUDA.

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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