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ANALYSIS OF GROUND WATER FROM SIX SELECTED STATIONS OF BABRA TALUKA-AMRELI DISTRICT-GUJARAT

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ABSTRACT

*Different Physico-chemical parameters of Ground water form selected stations such as Galkotdi, Hathigadh, Ishvariya, Khanpar, Jivapar and Ingorala of Babra Taluka of Amreli District is measured in terms of three different Seasons such as WINTER, SUMMER and MONSOON. 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. Results obtained are compared in terms of their highest value and lowest values among six stations in terms of **13** parameters.*

Keywords: Drinking Water, COD, TDS, Calcium content, Ground water, Turbidity.

1. Introduction

Water is the most valuable offerings of the mothernature to mankind; the terrestrial ecosystem cannot function without it. All life and peripheral activities are ceased without water **[1]**. More over to drinking and personal health, water is necessary for agricultural crop, industrial and manufacturing process, hydroelectric power generation, waste assimilation, recreation and wildlife etc. **[2, 3]** when a resource is used for so many diverse purposes, it is important that it be developed and used rationally and efficiently. From the very beginning, man realized the efficacy and essentiality of water for his daily life for that reason, water is called as life and it has been known as nectar **[4]**. Water is extremely elementary to life. One

cannot imagine a form of life that might exist without water. On the surface of the earth, water, in the form of oceans, seas, glaciers, freshwater bodies, rivers, wells, lakes, etc. occupies about 71.00 per cent of the area while, the landmass occupies about 29.00 per cent of the area **[5, 6]**. Considering that 71% as 100%, 97% is seawater which is salty, while only 3.00 per cent is fresh water. Polar ice contains about 2.00 per cent water and less than 1.00 per cent water is found in the form of lakes and groundwater. If we go through the data of water used 79% is used for irrigation, 23% water for industries and about 8% only is used for domestic purposes **[7]**. Groundwater is an important source but unfortunately prone to contamination by materials deleterious to human health **[8]**. In many areas of the world, infectivity is so high that the water is in poor condition even for agricultural use. Pollution levels of the ground water in densly populated are reached so high because of continuously withdrawn of groung water and formation of absorption pit. As this resource becomes more contaminated and scarcer, demand for high quality water will continue to grow making groundwater even more valuable and protection more important **[9, 10]**. Water sources are there for drinking and various journal use must have high degree clarity free from all types of pollution **[11]**. The source and quality of bore well water is a clip resource and easily available source of our life. Is getting polluted due to population increase and industrial use **[12]** Studies on bore well water hear, we report the physicochemical studies of bore wells water of Kathalal region, Kathalal is situated in kheda district of Gujarat state and its some interior Adivasi area **[13]**. Most of the isolated resenditial community i.e. community residing far away from the urban area i.e. Adivasi area mostly not getting safe drinking water. They don't have hygienic water supply so the people are complied to use water from any source that have near their village. In the most of remote tribal area the bore well water is used for drinking and other purpose. Bore well water is pure and it is not possible to spoil it but the main causes of bore well water's pollution is the use of chemicals, fertilizers, pesticides, lime, manures etc are **[14-16]**. Physico-chemical analysis of drinking water of kheda district of Gujarat state has been investigated in tesively **[17]**. Bore well water is commonly used for drinking and other uses in this area **[18]**. The use of chemicals, fertilizers, manure, lime, 10 refused dump etc. are the main source of bore well water's pollution. There is no fresh water supply for the people living in this region, so they use bore well water for their drinking and general purpose **[19]**. We have noted the physico-chemical analysis of bore well drinking water considering water at some amount. Fluoride is present in all natural water at some amount **[20]**. In spite to being low and high concentration of fluoride can occur depending upon the type of the rocks and the occurrence of the fluoride-bearing minerals in ground

water. Endemic of tropical climates another name of Fluorosis has been described as an. The main sources of fluoride in take are water **[21]**. 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 [**22**].

Sr. No.	Parameters of water analysis	Methods
1	P^H	Digital P^HMeter
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) **[22]**. 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					
		Galkotdi	**Hathigadh**	**Ishvariya**	**Khanpar**	**Jivapar**	**Ingorala**
1	TDS	475	550	**335**	525	**740**	625
2	pH	**6.70**	7.50	7.70	7.22	7.98	**8.02**
3	T. Hardness	**426**	315	310	270	**210**	265
4	Ca^{+2}	**65**	32	**27**	45	33	60
5	Mg^{+2}	48	**90**	44	35	38	**22**
6	Cl^{-1}	86	**30**	98	**170**	165	120
7	SO_4^{-2}	24	21	27	**08**	22	**45**
8	NO_3^{-1}	15.70	12.41	17.10	**21.40**	**7.53**	8.25
9	F^{-1}	0.3	0.3	0.6	0.9	**1.4**	**0.1**
10	Alkalinity	298	**280**	320	390	**465**	362
11	Turbidity	3.5	**1.4**	1.7	3.6	2.9	**4.3**
12	COD	14	11	**6**	10	14	**18**
13	BOD	5	09	**12**	7	**1**	4

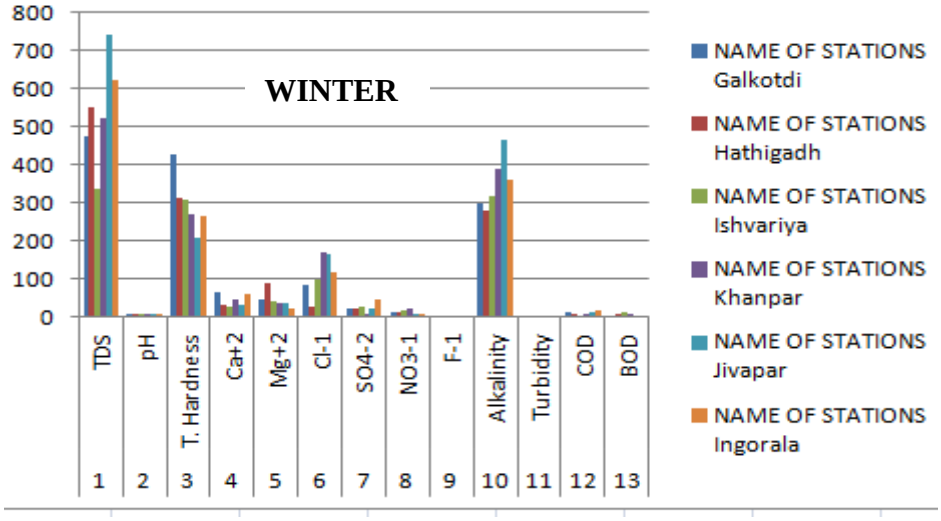

Figure 1 Physico-chemical parameter of ground water of **Babra** taluka (WINTER).

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

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Galkotdi	**Hathigadh**	**Ishvariya**	**Khanpar**	**Jivapar**	**Ingorala**
1	TDS	**360**	509	425	**735**	642	365
2	pH	7.90	**6.10**	**7.80**	7.10	7.60	7.40
3	T. Hardness	425	**438**	318	**219**	225	260
4	Ca^{+2}	58	**65**	**28**	55	36	58
5	Mg^{+2}	36	**85**	42	33	**20**	25
6	Cl^{-1}	85	**26**	97	95	**164**	105
7	SO_4^{-2}	28	18	27	**08**	**35**	15
8	NO_3^{-1}	15.35	12.36	17.15	**21.32**	**7.30**	8.50
9	F^{-1}	0.2	0.6	**0.1**	0.8	**1.4**	0.4

10	Alkalinity	**210**	295	320	390	**465**	360
11	Turbidity	3.2	2.1	**1.8**	3.4	2.9	**3.7**
12	COD	12	**03**	8	10	**15**	8
13	BOD	6	12	**14**	8	**1**	6

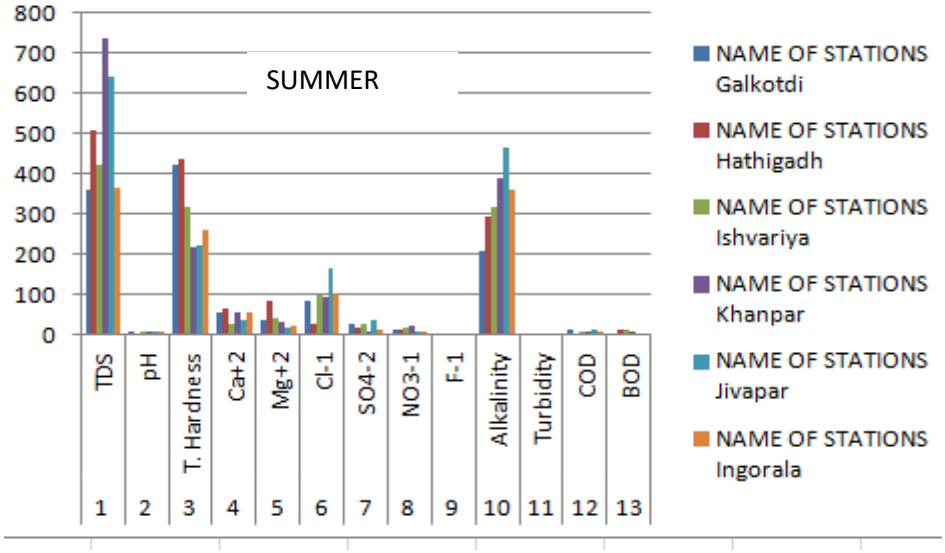

Figure 2 Physico-chemical parameter of ground water of **Babra** taluka (SUMMER).

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

SR. NO.	NAME OF PARAMETERS	NAME OF STATIONS					
		Galkotdi	**Hathigadh**	**Ishvariya**	**Khanpar**	**Jivapar**	**Ingorala**
1	TDS	550	720	590	625	**780**	**520**
2	pH	**7.10**	7.82	7.52	7.86	**8.96**	7.78
3	T. Hardness	249	210	**440**	315	235	**210**
4	Ca^{+2}	**90**	85	65	**30**	49	45
5	Mg^{+2}	45	**22**	38	70	**75**	48
6	Cl^{-1}	110	**145**	120	125	**24**	75
7	SO_4^{-2}	**23**	38	40	45	**46**	28
8	NO_3^{-1}	12.10	19.10	14.35	**26.12**	**9.35**	22.08
9	F^{-1}	1.24	1.21	**0.90**	1.10	**1.40**	0.98
10	Alkalinity	315	235	350	**208**	**385**	260
11	Turbidity	3.8	3.7	3.4	**4.1**	**1.1**	1.2
12	COD	1.72	**2.20**	**0.55**	0.78	1.16	0.80
13	BOD	5	7	**8**	3	**2**	4

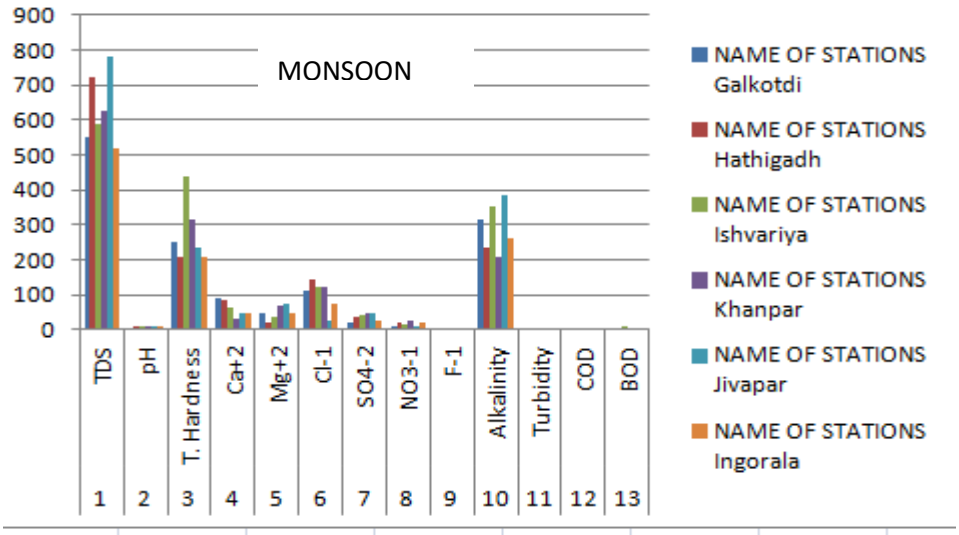

Figure 3 Physico-chemical parameter of ground water of **Babra** taluka (MONSOON).

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 **[22]** 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 **Jivapar** and lowest value at **Ishvariya**.

SUMMER Season shows highest value at **Khanpar** and lowest at **Galkotdi**.

MONSOON Season shows highest value at **Jivapar** and lowest at **Ingorala**.

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 **Ingorala** and lowest value at **Galkotdi**.

SUMMER Season shows highest value at **Ishvariya** and lowest at **Hathigadh**.

MONSOON Season shows highest value at **Jivapar** and lowest at **Galkotdi**.

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

WINTER Season shows highest value at **Galkotdi** and lowest value at **Jivapar**.

SUMMER Season shows highest value at **Hathigadh** and lowest at **Khanpar**.

MONSOON Season shows highest value at **Ishvariya** and lowest value at **Ingorala**.

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 **Galkotdi** and lowest value at **Ishvariya**.

SUMMER Season shows highest value at **Hathigadh** and lowest at **Ishvariya**.

MONSOON Season shows highest value at **Galkotdi** and lowest at **Khanpar**.

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 **Hathigadh** and lowest value at **Ingorala**.

SUMMER Season shows highest value at **Hathigadh** and lowest at **Jivapar**.

MONSOON Season shows highest value at **Jivapar** and lowest at **Hathigadh**.

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 **Khanpar** and lowest value at **Hathigadh**.

SUMMER Season shows highest value at **Jivapar** and lowest at **Hathigadh**.

MONSOON Season shows highest value at **Hathigadh** and lowest at **Jivapar**.

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 **Ingorala** and lowest value at **Khanpar**.

SUMMER Season shows highest value at **Jivapar** and lowest at **Khanpar**.

MONSOON Season shows highest value at **Jivapar** and lowest at **Galkotdi**.

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 **Khanpar** and lowest value at **Jivapar**.

SUMMER Season shows highest value at **Khanpar** and lowest at **Jivapar**.

MONSOON Season shows highest value at **Khanpar** and lowest at **Jivapar**.

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 **Jivapar** and lowest value at **Ingorala**.

SUMMER Season shows highest value at **Jivapar** and lowest at **Ishvariya**.

MONSOON Season shows highest value at **Jivapar** and lowest at **Ishvariya**.

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 **Jivapar** and lowest value at **Hathigadh**.

SUMMER Season shows highest value at **Jivapar** and lowest at **Galkotdi**.

MONSOON Season shows highest value at **Jivapar** and lowest at **Khanpar**.

3.11 Turbidity

Desirable limit is Up to 10NTU.

WINTER Season shows highest value at **Ingorala** and lowest value at **Hathigadh**.

SUMMER Season shows highest value at **Ingorala** and lowest at **Ishvariya**.

MONSOON Season shows highest value at **Khanpar** and lowest at **Jivapar**.

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 **Ingorala** and lowest value at **Ishvariya**.

SUMMER Season shows highest value at **Jivapar** and lowest at **Hathigadh**.

MONSOON Season shows highest value at **Hathigadh** and lowest at **Ishvariya**.

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 **Ishvariya** and lowest value at **Jivapar**.

SUMMER Season shows highest value at **Ishvariya** and lowest at **Jivapar**.

MONSOON Season shows highest value at **Ishvariya** and lowest at **Jivapar**.

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.

References

1. P. Lal, & F. Lal, (1977) Annuals of Arid Zone., 16: 213-220.
2. C. T., Jenkins, (1968) Ground Water, March-April, 1968m. (2).
3. K. D. Fausch, J. A. Falke, H. Griscom, (2005) Colorado State University. Print
4. C. W., Fetter, (2001). Applied Hydrogeology. Prentice Hall, Upper Saddle River, New Jersey.
5. S. C. Gupta, (1991). Annals of Arid Zone, 30 (4) : 315-321.
6. P. R. Bhagat. (2008) Rasāyan journal of chemistry,1 (1),195-197.
7. Dhyan Singh; Pandey, Chhonkar, and P. K., R. N. (2000) Soil Plant Water Analysis - A Methods Manual by Indian Agricultural Research Institute, New Delhi.
8. S. B. Bakare O. A. Ojo, and A. O. Babatunde,(2007) Afr. J. Infect. Dis. 1(1): 30 – 35.
9. N. J. Patil, G. B, Patil, P. B Lokande. and H. A. Mujawar (2006) MIDC, Raigad. IJEP; 26 (2): 167-74.
10. C. R, Ramakrishanaiah, C Sadashivaiah. and G. Ranganna (2009), India. E.J.Chem.; 6(2): 523-30
11. P. K., Dhyan Singh and Pandey; R. N. Chhonkar, (2000) Soil Plant Water Analysis - A Methods Manual by Indian Agricultural Research Institute, New Delhi.
12. Shah, .H. Shailesh (2009) Quality parameters of ground water in Borsad and Ankalav taluka (Dist :Anand, Gujarat). Current world Inviornment, 4 (2), 359366
13. D. S, Karanth, K. R. Deshmukh., (1973) Groundwater Resource, Madras. 3 : (1-8).
14. M. Fireman, and R. Reeve, (1950) Idaho, Proc. Soil Sci. Soc. Amer., 13 : 495-498.
15. K. R., Rushton, D., Jackson, (1987), Journal of Hydrology 92, 1-15
16. H. Shah, Shailesh. Trivedi, Vijay, R. B., Shah, N. J. Shah, Patel Hiren and Prajapati Tarang (2008) Drinking water quality of packaged water samples ,sold in and around Borsad Municipal town of Anand district of Gujarat.Science,7 (8)24-25.
17. Shashi, Yadav Chandraprabha, A. K., Jaitly, Laksyaveer, singh, M. Bansal and Gupta, k., Shiv (2008) Analysis of waste water from different waste water systems.Current World Environment, 3 (1)203-206.
18. B. L. Jain, (1979) A note on the quality of groundwater's in the arid tract of Pali district, Western Rajasthan. Ann. Arid Zone.,18 : 135-139.
19. Mehta and J. S., K. K., Kanwar (1968) Toxicity of fluorine in some well waters of Haryana and Punjab. Indian J. Agric. Sci., 38 : 881-886.

20. J. S., Mehta, K. K. Kanwar, (1970) Quality of well waters and its effect on soil properties. Indian J. Agric. Sci., 40 : 251-257.
21. R. Lal, K. S. Singh, (1974) A comparative study of the effect of qualities of irrigation water on different soils. J. Indian Soc. Soil Sci., 22: 19-25.
22. Chauhan M.L., Vyas N.N. Pandya R.N., Patel V.R., and Vohrab Nikhat, APHA, Standard Method for Estimation of Water and Waste Water, American Public Health Association, Washington D. C, (1989).