ORIENTAL JOURNAL OF CHEMISTRY
An International Open Access, Peer Reviewed Research Journal
www.orientjchem.org
ISSN: 0970-020 X
CODEN: OJCHEG
2024, Vol. 40, No.(3):
Pg. 877-881

Water Quality Analysis of Bibi Talav, Ahmedabad, Gujrat, India using Water Quality Index

SALAHUDDIN[1] and A. VIMALA RANI[2]

[1,2]Department of Mathematics, AMET University, Kanathur, Chennai, Tamilnadu, India.
*Corresponding author E-mail: vsludn@gmail.com, vimalaraniarul@ametuniv.ac.in

http://dx.doi.org/10.13005/ojc/400334

(Received: February 29, 2024; Accepted: May 17, 2024)

ABSTRACT

Water is very crucial liquid which has the potential to fluidly various materials along with biological and mineral substances. The condition of water usually indicates to the substance of water exist at the peak level for sufficient rise of plants and animals. The Bibi talav, Ahmedabad, Gujarat, India is situated at favela location. People discharge their domiciliary ravage unswervingly into the talav water forging environmental imperilment. The motive of this research paper is to establish the water quality index. Numerous physical and chemical parameters such as pH(BPH), Electrical Conductivity (BEC), Turbidity (BTD), Total dissolved solids (BTDS), Alkalinity (BAL), Total Hardness (BTH), Calcium(BCA), Chloride(BCL), Magnesium (BMG), Total dissolved Oxygen (BDO), Sodium (BSOD), Nitrates (BN) and Biochemical Oxygen demand (BBOD) of talav water is examined during three sessions such as monsoon, winter and summer. After calculating water quality index it shows that Bibi talav water is dangerous for drinking and survival of water borne species because the water quality index is above 75. This shows that water is unsuitable for drinking throughout the year.

Keywords: Bibi Talav, Water quality index, Collection of samples.

INTRODUCTION

For the survival of life water is one of the most crucial substances for the entire creature in the earth[3-6]. The earth is the only planet which covered 70% of water. By virtue of elevated human population, industrial actions and human discharges and other activities water is being contemned. So it is essential to examine water because drink of contaminated water is very dangerous for the health of human being. By drinking contaminated water the creature can be affected by water borne diseases which are very hazardous. Good quality of water can prevent diseases and improve quality of life. Natural water consists of various variety of contamination such as depreciation of rocks and percolate of solids, disintegration sprinkler particles from the surrounding spaces and human activities. Discharge particles from industry are the main cause of water contamination. Water must be examined for different physic-chemical parameters for the safety of drinking purposes. Water contains numerous types of hovering, diluted, dangling and microbiological impurities. Due to this the water quality is worsen day by day for drinking purposes. For improving the water quality it is essential to examine the physic-chemical parameters of water such as pH, Electrical Conductivity, Turbidity), Total dissolved solids, Alkalinity, Total Hardness, Calcium, Chloride,

Magnesium, Total dissolved Oxygen, Sodium, Nitrates and Biochemical Oxygen demand. After examine suitable measurement should be needed so that water quality will be improved for drinking purposes.

Various procedures are obtainable to examine the water quality data to get a conclusion. Water quality index method is very useful method for examine the water quality and it gives the result whether the water is good or bad for drinking purposes.

The main dogma of this investigation is to develop an overall picture of the Bibi Talav water using water quality index and establish a result whether it is suitable for drinking purposes or not.

MATERIALS AND METHODS

Selected Area

The Bibi Lake is a natural lake. It is situated at Saiyedwadi, Isanpur, Ahmedabad, Gujarat. Its distance from Amraiwadi Metro station is 3.47 kilometers and from Vatva railway station is 0.54 kilometers. Its co-ordinates are 22°57'54"N and 72°36'30"E.

Collection of Samples

Water samples are collected from seven locations of Bibi Talav into tight fit plastic container to keep away from vaporization.

Sampling Procedure

To recognize the usefulness of Talav water the chemical-physical parameters which is scrutinized are pH(BPH), Electrical Conductivity(BEC), Turbidity(BTD), Total dissolved solids(BTDS), Alkalinity(BAL), Total Hardness(BTH), Calcium(BCA), Chloride(BCL), Magnesium(BMG), Total dissolved Oxygen(BDO), Sodium(BSOD), Nitrates(BN) and Biochemical Oxygen demand (BBOD) and illustrated in Table (1-3) and graphically interpreted in Figure (1-3).

For the measurement of pH (HPH), pH meter is used. Apex Hanna Electrical Conductivity (EC) Meter, EC-03 is used for measuring Electrical Conductivity (BEC). Turbidity (BTD) is measured using a Turbidity Meter WAG-WT30020. For determining Total Dissolved Solids (BTDS) TDS meter (Themisto TH-TDS10) is used. For determining Alkalinity (BAL) titration method is involved. Total Hardness (BTH) is measured by colorimetric titration with EDTA solution (Model HA-71A). Photometer (Model-HI97720) is involved for determining Calcium(BCA) and Magnesium(BMG). For determining Chloride(BCL) Chloridometer(Model 3400, ELITechGroup Inc) is used. Measurement of Dissolved Oxygen(BDO) is done by Winkler's method. Flame Photometer(Sherwood Model 410) is used for measuring Sodium(BSOD). Nitrates(BN) are determined by phenol disulphonic acid method. Tinometer Oxidirect(Model BD 600) is used for measuring Biochemical Oxygen demand(BBOD).

The below method is established for estimating Water Quality Index which is developed by Brown *et al.,*[2].

Calculate the unit weight(W_n) factors for each parameters by using the formula

$$W_n = \frac{k}{S_n}$$

Where $k = \frac{1}{\frac{1}{S_1}+\frac{1}{S_2}+\frac{1}{S_3}+\cdots+\frac{1}{S_n}} = \frac{1}{\sum\frac{1}{S_n}}$

S_n = Standard desirable value of the n^{th} parameters.(WHO)

On summation of all selected parameters unit weight factors, $W_n = 1$.

Calculate the Sub-index(Q_n) value by using the formula

$$Q_n = \frac{[V_n - V_0]}{[S_n - V_0]} * 100$$

Where V_n = mean concentration of n^{th} parameters.

S_n = Standard desirable value of the n^{th} parameters.

V_0 = Actual values of the parameters in Pure water (generally $V_0 = 0$, for most parameters except pH).

For pH,

$$Q_{pH} = \frac{[V_{pH} - 7]}{[8.5 - 7]} * 100$$

Combining a and b, WQI is calculated as follows

Overall WQI = $WQI = \frac{\sum W_n Q_n}{\sum W_n}$

The calculated water quality index is represented in Table (4-6) and the status of the water quality index is represented in Table 7.

Table 1: Water Quality at different locations of Bibi Talav in monsoon season (Laboratory Analysis)

Name of Station	BPH	BEC	BTD	BTDS	BAL	BTH	BCA	BCL	BMG	BDO	BSOD	BN	BBOD
BL1	8.8	3.13	17.2	958	242	279	46.2	99	33.2	4.74	45.3	8.7	1.19
BL2	9.0	3.16	16.1	960	240	277	47.4	97	32.2	4.71	43.2	8.6	1.21
BL3	8.7	3.10	18.0	956	239	275	44.3	98	34.4	4.72	46.3	8.3	1.15
BL4	8.9	3.14	19.2	958	243	276	49.5	96	33.2	4.75	42.2	8.9	1.18
BL5	8.6	3.09	17.3	954	244	278	48.3	99	35.3	4.72	47.4	8.5	1.17
BL6	8.8	3.12	16.2	957	238	279	46.2	97	33.4	4.73	41.3	8.8	1.21
BL7	9.1	3.16	14.3	960	239	278	44.3	96	34.2	4.71	48.2	8.6	1.23

Table 2: Water Quality at different locations of Bibi Talav in winter season (Laboratory Analysis)

Name of Station	BPH	BEC	BTD	BTDS	BAL	BTH	BCA	BCL	BMG	BDO	BSOD	BN	BBOD
BL1	8.3	3.10	19.2	1065	190	250	39.3	98	35.4	5.34	40.4	8.4	2.26
BL2	8.5	3.05	18.3	1056	189	248	38.6	97	33.5	5.42	46.3	8.4	2.18
BL3	8.2	3.06	20.4	1058	194	258	36.8	96	34.9	5.48	41.2	8.2	2.22
BL4	8.4	3.03	18.8	1067	195	249	34.7	94	36.2	5.39	39.5	7.9	2.32
BL5	8.2	3.09	18.7	1058	189	257	39.2	98	32.4	5.48	37.9	8.0	2.18
BL6	8.1	3.08	18.4	1069	187	253	38.5	96	31.5	5.41	43.2	7.8	2.23
BL7	7.8	3.05	19.5	1067	196	259	37.2	97	32.4	5.43	42.5	8.1	2.24

Table 3: Water Quality at different locations of Bibi Talav in summer season (Laboratory Analysis)

Name of Station	BPH	BEC	BTD	BTDS	BAL	BTH	BCA	BCL	BMG	BDO	BSOD	BN	BBOD
BL1	9.5	3.55	26.5	1250	276	235	31.2	103.4	31.4	3.40	53.3	7.2	2.45
BL2	9.1	3.49	23.8	1253	267	234	32.4	101.4	33.1	3.38	55.9	7.8	2.34
BL3	9.6	3.59	24.9	1249	271	242	34.8	99.8	30.9	3.42	52.2	7.5	2.34
BL4	9.1	3.57	25.2	1261	265	241	35.2	105.2	29.8	3.45	55.3	7.1	2.42
BL5	8.9	3.59	23.9	1256	272	238	33.8	101.2	32.5	3.36	52.5	6.9	2.46
BL6	9.6	3.50	25.4	1253	278	236	36.2	103.2	33.2	3.39	53.6	6.7	2.48
BL7	9.1	3.52	22.9	1249	269	237	31.9	98.6	31.6	3.45	50.2	7.5	2.39

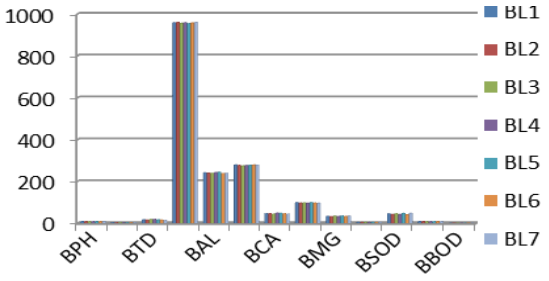

Fig. 1. Graphical representation of Water Quality at different locations of Bibi Talav in monsoon season

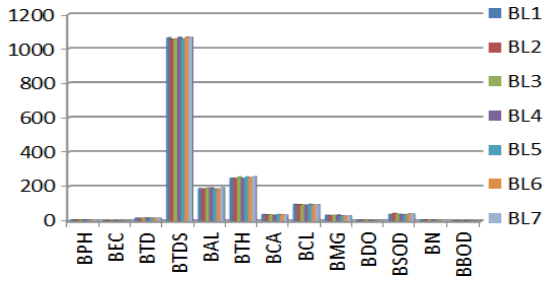

Fig. 2. Graphical representation of Water Quality at different locations of Bibi Talav in winter season

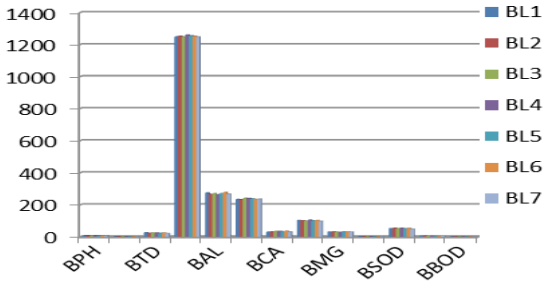

Fig. 3. Graphical representation of Water Quality at different locations of Bibi Talav in summer season

From Table 4, Monsoon time $WQI = \frac{\sum W_n Q_n}{\sum W_n} = \frac{142.8431}{1} = 142.8431.$

Table 4: Water Quality Index (Monsoon)

Parameters	S_n	$1/S_n$	$\sum 1/S_n$	$k=1/\sum 1/S_n$	$W_n = k/S_n$	V_0	V_n	$[V_n-V_0]/([S_n-V_0]$	Q_n	$W_n Q_n$
BPH	8.5	0.117647	0.744908	1.342448	0.157935	7	8.842857	1.228571	122.8571	19.40345
BEC	500	0.002	0.744908	1.342448	0.002685	0	3.128571	0.006257	0.625714	0.00168
BTD	5	0.2	0.744908	1.342448	0.26849	0	16.9	3.38	338	90.74947
BTDS	500	0.002	0.744908	1.342448	0.002685	0	957.5714	1.915143	191.5143	0.514196
BAL	100	0.01	0.744908	1.342448	0.013424	0	240.7143	2.407143	240.7143	3.231464
BTH	200	0.005	0.744908	1.342448	0.006712	0	277.4286	1.387143	138.7143	0.931083
BCA	75	0.013333	0.744908	1.342448	0.017899	0	46.6	0.621333	62.13333	1.112143
BCL	200	0.005	0.744908	1.342448	0.006712	0	97.42857	0.487143	48.71429	0.326982
BMG	150	0.006667	0.744908	1.342448	0.00895	0	33.7	0.224667	22.46667	0.201069
BDO	7.5	0.133333	0.744908	1.342448	0.178993	0	4.725714	0.630095	63.00952	11.27827
BSOD	200	0.005	0.744908	1.342448	0.006712	0	44.84286	0.224214	22.42143	0.150498
BN	10	0.1	0.744908	1.342448	0.134245	0	8.628571	0.862857	86.28571	11.58341
BBOD	6.9	0.144928	0.744908	1.342448	0.194558	0	1.191429	0.172671	17.26708	3.359443
									Total	142.8431

From Table 5, Winter time $WQI = \frac{\sum W_n Q_n}{\sum W_n} = \frac{150.7278}{1} = 150.7278.$

Table 5: Water Quality Index (winter)

Parameters	S_n	$1/S_n$	$\sum 1/S_n$	$k=1/\sum 1/Sn$	$Wn=k/S_n$	V_0	V_n	$[V_n-V_0]/([S_n-V_0]$	Q_n	$W_n Q_n$
BPH	8.5	0.117647	0.744908	1.342448	0.157935	7	8.214286	0.809524	80.95238	12.78522
BEC	500	0.002	0.744908	1.342448	0.002685	0	3.065714	0.006131	0.613143	0.001646
BTD	5	0.2	0.744908	1.342448	0.26849	0	19.04286	3.808571	380.8571	102.2562
BTDS	500	0.002	0.744908	1.342448	0.002685	0	1062.857	2.125714	212.5714	0.570732
BAL	100	0.01	0.744908	1.342448	0.013424	0	191.4286	1.914286	191.4286	2.569829
BTH	200	0.005	0.744908	1.342448	0.006712	0	253.4286	1.267143	126.7143	0.850537
BCA	75	0.013333	0.744908	1.342448	0.017899	0	37.75714	0.503429	50.34286	0.901102
BCL	200	0.005	0.744908	1.342448	0.006712	0	96.57143	0.482857	48.28571	0.324105
BMG	150	0.006667	0.744908	1.342448	0.00895	0	33.75714	0.225048	22.50476	0.20141
BDO	7.5	0.133333	0.744908	1.342448	0.178993	0	5.421429	0.722857	72.28571	12.93864
BSOD	200	0.005	0.744908	1.342448	0.006712	0	41.57143	0.207857	20.78571	0.139519
BN	10	0.1	0.744908	1.342448	0.134245	0	8.114286	0.811429	81.14286	10.893
BBOD	6.9	0.144928	0.744908	1.342448	0.194558	0	2.232857	0.323602	32.36025	6.295934
									Total	150.7278

From table 6, Winter time $WQI = \frac{\sum W_n Q_n}{\sum W_n} = \frac{187.5987}{1} = 187.5987.$

Table 6: Water Quality Index (summer)

Parameters	S_n	$1/S_n$	$\sum 1/S_n$	$k=1/\sum 1/S_n$	$W_n=k/S_n$	V_0	V_n	$[V_n-V_0]/([S_n-V_0]$	Q_n	$W_n Q_n$
BPH	8.5	0.117647	0.744908	1.342448	0.157935	7	9.271429	1.514286	151.4286	23.91588
BEC	500	0.002	0.744908	1.342448	0.002685	0	3.544286	0.007089	0.708857	0.001903
BTD	5	0.2	0.744908	1.342448	0.26849	0	24.65714	4.931429	493.1429	132.4037
BTDS	500	0.002	0.744908	1.342448	0.002685	0	1253	2.506	250.6	0.672835
BAL	100	0.01	0.744908	1.342448	0.013424	0	271.1429	2.711429	271.1429	3.639951
BTH	200	0.005	0.744908	1.342448	0.006712	0	237.5714	1.187857	118.7857	0.797318
BCA	75	0.013333	0.744908	1.342448	0.017899	0	33.64286	0.448571	44.85714	0.802912
BCL	200	0.005	0.744908	1.342448	0.006712	0	101.8286	0.509143	50.91429	0.341749
BMG	150	0.006667	0.744908	1.342448	0.00895	0	31.78571	0.211905	21.19048	0.189647
BDO	7.5	0.133333	0.744908	1.342448	0.178993	0	3.407143	0.454286	45.42857	8.131398
BSOD	200	0.005	0.744908	1.342448	0.006712	0	53.28571	0.266429	26.64286	0.178833
BN	10	0.1	0.744908	1.342448	0.134245	0	7.242857	0.724286	72.42857	9.723158
BBOD	6.9	0.144928	0.744908	1.342448	0.194558	0	2.411429	0.349482	34.94824	6.799447
									Total	187.5987

Table 7: Water Quality Index (WQI) and status of water quality

WQI	Quality of Water
0-25	Very Good
26-50	Good
51-75	Poor
Above 75	Very Poor(unsuitable for drinking)

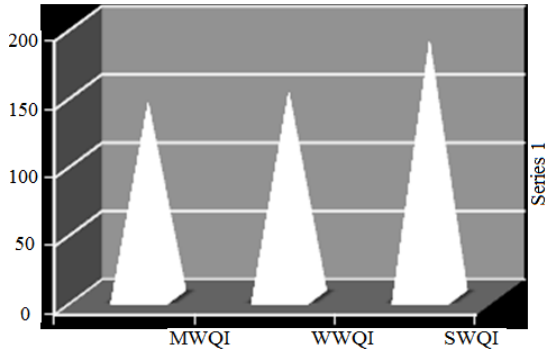

Fig. 4. Comparison of Water Quality Index

RESULTS AND DISCUSSION

In the present study, the result shows that maximum parameters are out of desirable limits prescribed by World Health organization which is proved by water quality index that the water is polluted and not useful for drinking purposes because water quality index is above 75. The Water Quality Index is very useful for the conclusion of the water quality for drinking purposes whether it is suitable or not. In this investigation, the water quality index of Bibi talab samples is found above 75 in all three season that is winter, summer and monsoon. A comparison is given in pictorial representation in Fig. 4. This shows that Bibi talav water is not suitable for drinking purposes.

CONCLUSION

The present investigation concluded that WQI of Bibi talav in three seasons are 142.8431, 150.7278 and 187.5987 which are above 75. More than 75 of water quality indicate that the water quality is unsuitable for drinking purposes. This is too high means that the water quality of Bibi Talav is highly polluted. Hence suitable measurement should be required for this tank water so that it can be suitable for drinking purposes.

ACKNOWLEDGMENT

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

From the author side there is no conflict of interest regarding this research paper.

REFERENCES

1. Brown, R. M.; McClelland NI, Deininger RA, Tozer RG, Water quality index-do we dare *Water Sew Works.,* **1970**, *117*(10), 339–343.
2 Brown, R. M.; McClelland, N.I.; Deininger, R. A.; O'Connor, M. F., A water quality index—crashing the psychological barrier., *Indicators of Environmental Quality.*, **1972**, 173-182.
3. Horton, R. K.; An index number system for rating water quality., *J Water Pollut Control Fed.,* **1965**, *37*(3), 300–306.
3. Salahuddin, Water Quality Analysis of Hebbal Lake, Bangalore, Karnataka, India for the Survival of Fishes., *Journal of Survey in Fisheries Sciences.*, **2023**, *10*(1S), 5489-5498.
4. Salahuddin., Physico-chemical analysis of upper lake water in Bhopal region of Madhya Pradesh, India., *Advances in Applied Science Research.*, **2014**, *5*(5), 165-169.
5. Salahuddin., Analysis of electrical conductivity of ground water at different locations of Dildar Nagar of U.P, India., *Advances in Applied Science Research.*, **2015**, *6*(7), 137-140.
6. Salahuddin., Analysis of Magnesium contents of Ground water at surrounding areas of Dildar Nagar of U.P. *India. International Journal of Innovative Research in Science, Engineering and Technology.*, **2020**, *9*(4), 1607-1610.
7. APHA., Standard Methods for the Examination of Water and Wastewater., APHA-AWWA-WPCF, Washington D.C., **1998**.
8. Salahuddin and Husain.; Intazar, Analysis of Katraj Lake Water in Pune Region of Maharashtra, *India. International Journal of Lakes and Rivers.*, **2020**, *13*(1), 27-34.