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Research Article

ESTIMATION OF WATER QUALITY INDEX OF WATER SOURCES IN GUNSA VILLAGE, DADRA AND NAGAR HAVELI, INDIA

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A B S T R A C T

In order to determine the water quality of Gunsa village water sources seven numbers of sample were collected from open well and bore well water sources. Water samples were collected from Shivpada, Karbharipada and Sawarpada locations and analyzed for the parameters of pH, Color, TDS, Turbidity, Total Hardness, Total Alkalinity, Chloride, Sulphate, Nitrate, Calcium, Magnesium, Iron, Zinc, Fluoride, *E.Coli*, and Total coliform bacteria. Weighted arithmetic index method was applied for determination of WQI. WQI was calculated on the basis of chemical test parameters, evaluated WQI was 119.2 (Unsuitable for drinking), 51.54 (Poor water Quality), 20.6 (Excellent water quality), 63.9 (Poor water Quality), 60.1 (Poor water quality), 33.5 (Good water quality) and 83.4 (very poor water Quality) for the location of 1 to 7 respectively. Biological test parameters found positive in all the samples hence, it is recommended to establish a water treatment facility at Gunsa village to increase the water quality and make it suitable for drinking purpose.

INTRODUCTION

In presented Research paper, a study has been carried out to evaluate the water quality of Gunsa village [3,4,5,6]. Well water and bore well water samples were collected from seven different locations (refer table 1) and analyzed for the parameter of pH, Color, TDS, Turbidity, Total Hardness, Total Alkalinity, Chloride, Sulphate, Nitrate, Calcium, Magnesium, Iron, Zinc, Fluoride, *E.Coli*, and Total coliform bacteria[1,2]. Chemical and Biological test parameters of water sample were evaluated on the basis of Indian standard specification IS 10500:2012.The weighted arithmetic index method was used for determination of WQI.

Table 1 Sampling location and GPS Identification

Location No	Source	Name of Location	GPS
1	Open well water	Shivpada	N 20°10’ 54” E 73°10’ 50”
2		Shivpada	N 20° 11’ 30” E 73°11’ 25”
3		Shivpada	N 20° 11’ 28” E 73°11’ 9”
4		Karbharipada	N 20° 11’ 5” E 73°10’ 55”
5		Karbharipada	N 20°10’ 55” E 73°11’ 2”
6	Bore well water	Sawarpada	N 20°11’ 20” E 73°11’11”
7		Sawarpada	N 20° 10’ 15” E 73°10’ 59”

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METHODOLOGY

Total 7 samples from open well and bore well water was collected and analyzed during the month of January 2017. Sampling site was tracked with GPS identifications. Water sample were collected and analyzed as per IS 10500(2012) and APHA specifications[8,9].

Table 2 Specification and Test Method

Sr No	Test Parameter	Unit	Specification Limit (Si)	Method
1	pH Value	NA	6.5 to 8.5	IS3025(Part-11)
2	Color	Hazen	5 Max.	IS3025(Part-4)
3	Total Dissolved Solids	mg/L	500 Max.	IS3025(Part-16)
4	Turbidity	NTU	1 Max.	APHA 2130 B
5	Total Hardness	mg/L	200 Max.	IS3025(Part-21)
6	Total Alkalinity as Calcium Carbonate	mg/L	200 Max.	IS3025(Part-23)
7	Chloride as Cl	mg/L	250 Max.	IS3025(Part-32)
8	Sulphate as SO4	mg/L	200 Max.	IS3025(Part-24)
9	Nitrate as NO3	mg/L	45 Max	IS3025(Part-34)
10	Calcium as Ca	mg/L	75 Max.	IS3025(Part-40)
11	Magnesium as Mg	mg/L	30 Max.	IS3025(Part-46)
12	Iron as Fe	mg/L	0.3 Max	APHA (22ndEdi.)3500 FeB
13	Zinc as Zn	mg/L	5 Max.	AAS APHA (22ndEdi.)3111 B
14	Fluoride as F	mg/L	1 Max.	APHA (22nd)4500F D-Spands
15	E.Coli	/100 ml	Absent	IS1622:1981Edi.2.4(2003-05)
16	Total Coliform Bacteria	/100 ml	Absent	APHA(22ndEdi) 9221-D

Water Quality Index Calculation:

Calculation of weighted arithmetic index method is as below

1. Relative weight (Wi): 1/ Specification Limit (Si)
2. Quality rating (Qi) :100* (Test result- Ideal value)/ (Specification limit Si- Ideal value)
3. Ideal value is 0 for all the parameters accept pH and DO, Ideal value for pH is 7 and 14.6 ppm for DO.
4. Weighted Qi value : Relative weight (Wi)* Quality rating (Qi)
5. Water Quality Index WQI : Σ Weighted Qi value/Σ Relative weight (Wi)

Table 3 Classification of Water Quality Index (WQI)

WQI	Classification
0-25	Excellent water quality
26-50	Good water quality
51-75	Poor water quality
76-100	Very Poor water quality
>100	Unsuitable for drinking

RESULTS AND DISCUSSION

Chemical test parameters pH, Color, TDS, Total Hardness, Total Alkalinity, Chloride, Sulphate, Nitrate, Calcium, Magnesium, Zinc and Fluoride were found under the specification limit of IS 10500:2012 in bore well and open well water sample. Turbidity value was observed beyond the specification limit in sample location 1, 5 and 7 .Iron value was observed very high and found out of specification limit in sample location 1. Biological test parameter *E.Coli* found positive in all the samples accept Location 7. Total Coliform Bacteria found present in all the sampling locations. WQI was observed 119.2, 51.54, 20.6, 63.9, 60.1, 33.5 and 83.4 for the of Location 1,2,3,4,5,6,7 and 8 respectively.

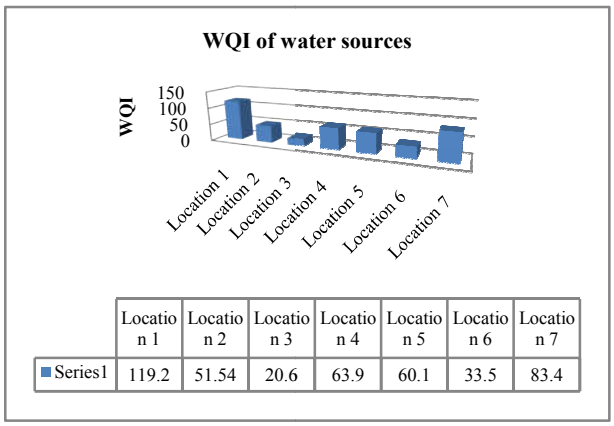

Fig 1 WQI of Water sources.

Table 4 Analysis test results of Location 1.

No	Chemical Test Parameter	Test Result of Location 1	Relative weight (Wi)	Quality rating (Qi)	Weighted Qi value
1	pH Value	7.06	0.12	4.00	0.47
2	Color, Hazen	5	0.20	100.00	20.00
3	Total Dissolved Solids, mg/L	280	0.0020	56.00	0.11
4	Turbidity, NTU	1.34	1.00	134.00	134.00
5	Total Hardness as CaCO3,mg/L	174	0.01	87.00	0.44
6	Total Alkalinity , mg/L	156	0.01	78.00	0.39
7	Chloride as Cl, mg/L	14	0.004	5.60	0.02
8	Sulphate as SO4, mg/L	18	0.01	9.00	0.05
9	Nitrate as NO3, mg/L	0.32	0.02	0.71	0.02
10	Calcium as Ca, mg/L	58.31	0.01	77.75	1.04
11	Magnesium as Mg, mg/L	5.93	0.03	19.77	0.66
12	Iron as Fe, mg/L	0.48	3.33	160.00	533.33
13	Zinc as Zn, mg/L	0.88	0.20	17.60	3.52
14	Fluoride as F, mg/L	0.14	1.00	14.00	14.00
	Σ value		0.42		50.57
	WQI=Σ weighted Qi/Σ relative weight Wi			119.2	
	Microbiological Test Parameter	Result			
15	E.Coli , /100 ml	Present			
16	Total Coliform Bacteria, /100	Present			

Table 5 Analysis test results of Location 2 to 7.

No	Chemical Test Parameter	Test Result of Location 2	Test Result of Location 3	Test Result of Location 4	Test Result of Location 5	Test Result of Location 6	Test Result of Location 7
1	pH Value	7.21	7.2	7.21	7.11	7.25	7.47
2	Color, Hazen	2	2	3	2	2	5
3	Total Dissolved Solids, mg/L	181	226	251	204	192	306
4	Turbidity, NTU	0.71	0.34	0.96	1.74	0.62	1.15
5	Total Hardness as CaCO3,mg/L	101	119	141	125	83	173
6	Total Alkalinity , mg/L	94	106	139	118	94	1.62
7	Chloride as Cl, mg/L	7	11.6	10.6	7.4	8	20.32
8	Sulphate as SO4, mg/L	28	29	34	31.2	38	30.1
9	Nitrate as NO3, mg/L	0.16	0.32	0.31	0.21	0.22	0.18
10	Calcium as Ca, mg/L	22.65	31	32	31.2	20.63	45.11
11	Magnesium as Mg, mg/L	7.5	8.66	11.32	12.07	5.1	13.21
12	Iron as Fe, mg/L	0.19	0.05	0.22	0.14	0.1	0.29
13	Zinc as Zn, mg/L	0.47	0.04	0.73	0.02	0.81	0.91
14	Fluoride as F, mg/L	0.1	0.21	0.2	0.16	0.11	0.28
	WQI	51.54	20.6	63.9	60.1	33.5	83.4
	Microbiological Test Parameter	Result	Result	Result	Result	Result	Result
15	E.Coli , /100 ml	Present	Present	Present	Present	Present	Absent
16	Total Coliform Bacteria, /100	Present	Present	Present	Present	Present	Present

CONCLUSION

Water sample of Gunsa Village location were analyzed for the Chemical and Biological parameters in the month of January 2017 and compared with the IS 10500:2012 specification for drinking water. WQI was calculated with using weighted arithmetic index method. WQI classified Excellent water quality at location 3, Good water quality at Location 6, Poor water quality at location 2 , 4 and 5 ,very poor water quality at Location 7 and Unsuitable water quality for drinking purpose at location 1. Microbiological test parameters found positive in all the sampling locations. Presented paper indicates the water quality of Gunsa village and on the basis of Chemical, Biological and WQI results it is highly recommended to develop a water treatment facility in Gunsa village to enhance the water quality and Suitability of water for drinking purpose.

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