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Research Article

A STUDY OF PHYSICO CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF SABARMATI RIVER WATER IN AHMEDABAD CITY, GUJARAT, INDIA

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ABSTRACT

Sabarmati River water sample was analyzed for the Chemical and Biological parameters such as pH, BOD, DO, COD, Phosphate, Conductivity and Total Coliform Organisms. River water samples were seasonally collected from the location of Dr. Ambedkar bridge, Sardar bridge, Swami Vivekanand bridge, Gandhi bridge and Subhash bridge. Evolution of Chemical and Microbiological Test results concluds that Sabarmati river water does not classified in Class-A,B or C Category, hence water treatment and disinfection process of river water was required before its use for drinking purpose.

INTRODUCTION

Sabarmati River Basin has a length about 300 km and its covered the Rajasthan and Gujarat state. Sabarmati Basin covers total catchment area of 21674 km^2 out of it 18550 km^2 area covers in Gujarat state. Current Research paper focused on Sabarmati river water quality in Ahmedabad city. Total 15 river water samples were collected from five locations and seasonal analysis was carried out in the month of March 2016, July 2016 and December 2016 for the parameter of pH, BOD, COD, DO, Phosphate, Conductivity and Total Coliforms organisms. Analytical test results of Physico chemical and Biological parameters was compared with the CPCB Classification of River water (CPCB, 1994) and estimated the Status of Sabarmati river water quality in Ahmedabad city (Fig. 1) and Table 1.

MATERIAL AND METHODS

Total 15 River water samples were collected from five locations during the month of March-2016, july-2016 and December-2016. Sampling site was tracked with GPS identifications. Water sample were collected and analyzed as per IS 10500(2012) specifications. Water quality was evaluated as per specifications given in Indian Standard guideline IS 10500 (2012) and APHA (Table 2).

Sampling Time: Water sampling was carried out in the second week of March 2016, July 2016 and December 2016. Sampling schedule was morning 9.30 am to evening 5.30 pm.

Sampling Process: In order to achieve accurate test results, sample preservation method is highly required. Sampling container and sampling technique also have an impact on Analytical test results. Indian standard method (IS) and APHA method was followed for sampling and preservation of water sample (Guidelines for Water Quality Monitoring, 2007; Arvnabh, 2010).

RESULT AND DISCUSSION

Sabarmati river water sample from Location 1, observed pH range of water between 6.9 to 7.4, BOD value was calculated between 6.1 to 8.5 ppm, COD value was obtained between 6 to 9 ppm, DO value was found between 7.2 to 9.6 ppm, Phosphate value

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Fig. 1 Sabarmati river flow in Ahmedabad city.

Table 1. Sampling site location and GPS identification.

Location	Area	GPS Identification
1	Dr. Ambedkar bridge	22°59'43.7"N 72°33'54.6"E (Khodiyarnagar)
2	Sardar bridge	23°00'37.3"N 72°34'33.2"E (River front walkway)
3	Swami Vivekanand bridge	23°01'20.3"N 72°34'26.9"E (River front walkway)
4	Gandhi bridge	23°02'23.8"N 72°34'19.9"E (Shreyas colony)
5	Subhash bridge	23°03'44.6"N 72°35'06.1"E (Old Wadag)

Table 2. Standard methods.

S No	Test Parameters	Unit	Method
1	pH Value	NA	IS3025 Part-11
2	BOD	ppm	IS 3025 Part-44
3	COD	ppm	IS 3025 Part-58
4	DO	ppm	IS 3025 Part-38
5	Phosphate	ppm	APHA (22nd Edition)
6	Conductivity	µs/cm	IS 3025 Part-14
7	Total Coliforms organism MPN/100 ml,	MPN/100 ml,	APHA (22nd Edition)

was identified between 6.7 to 9.3 ppm, river water conductivity was observed between 507 to 685 µs/cm. Total Coliform organism MPN/100 ml was observed >1600.

Analysis of Sabarmati river water sample from Location 2, Evaluated pH range of water between 6.9 to 7.2, BOD value was Calculated between 7.4 to 9.4 ppm, COD value was obtained between 5 to 8 ppm, DO value was obtained between 8.3 to 10.2 ppm, Phosphate value was found between 5.8 to 8.8 ppm, Sabarmati river water conductivity was obtained between 421 to 607 µs/cm. Total Coliform organism MPN/100 ml was found >1600 (APHA, 2009; WHO, 1992; Zafar and Sultana; 2008; Yakub and Ugwumba, 2009; Water quality, 2011).

Physicochemical and Biological test parameter of Location 3, observed pH range between 6.8 to 6.9, BOD value was estimated between 7.6 to 9.6 ppm, COD value was obtained between 4 to 7ppm, DO value was observed between 8.7 to 10.5 ppm, Phosphate value was evaluated between 5.3 to 7.4 ppm, Sabarmati river water conductivity was obtained between 482 to 569 µs/cm. Total Coliform organism MPN/100 ml was estimated >1600.

Chemical and Microbiological test parameter of Location 4, observed pH range between 6.7 to 7.0, BOD value was found between 8.2 to 10.2 ppm, COD value was obtained between 5 to 6 ppm, DO value was observed between 9.2 to 11.1 ppm, Phosphate value was evaluated between 5.1 to 6.5 ppm, Sabarmati river water conductivity was obtained between 411 to 521 µs/cm. Total Coliform organism MPN/100 ml was observed >1600.

Analysis of Sabarmati river water sample from Location 5, obderved pH value of water between 6.7 to 6.9, BOD value was Calculated between 8.5 to 10.4 ppm, COD value was obtained between 4 to 6 ppm, DO value was obtained between 9.7 to 11.7 ppm, Phosphate value was found between 5.3 to 6.2 ppm, river water conductivity was obtained between 428 to 510 µs/cm. Total Coliform organism MPN/100 ml was evaluated >1600 (Tables 3-7) and (Fig. 2-7).

Table 3. Chemical and biological test results of Location 1.

Location	**1**					
Site	**Dr. Ambedkar bridge**					
Parameters	**Summer**	**Winter**	**Monsoon**	**Max.**	**Avg.**	**Min.**
pH	7.4	7.2	6.9	7.4	7.2	6.9
BOD (ppm)	6.1	7.3	8.5	8.5	7.3	6.1
COD (ppm)	9	8	6	9	7.7	6
DO (ppm)	7.2	8.1	9.6	9.6	8.3	7.2
Phosphate (ppm)	9.3	8.1	6.7	9.3	8.0	6.7
Conductivity (µs/cm)	507	577	685	685	590	507
Total Coliforms organism MPN/100 ml, Max	>1600	>1600	>1600	>1600	>1600	>1600

Table 4. Chemical and biological test results of Location 2.

Location	**2**					
Site	**Sardar bridge**					
Parameters	**Summer**	**Winter**	**Monsoon**	**Max.**	**Avg.**	**Min.**
pH	7.2	7.0	6.9	7.2	7.0	6.9
BOD (ppm)	7.4	8.3	9.4	9.4	8.4	7.4
COD (ppm)	8	6	5	8	6.3	5
DO (ppm)	8.3	8.7	10.2	10.2	9.1	8.3
Phosphate (ppm)	8.8	7.9	5.8	8.8	7.5	5.8
Conductivity (µs/cm)	588	421	607	607	539	421
Total Coliforms organism MPN/100 ml, Max	>1600	>1600	>1600	>1600	>1600	>1600

Table 5. Chemical and Biological test results of Location 3.

Location	**3**					
Site	**Swami Vivekanand bridge**					
Parameters	**Summer**	**Winter**	**Monsoon**	**Max.**	**Avg.**	**Min.**
pH	6.9	6.8	6.8	6.9	6.8	6.8
BOD (ppm)	7.6	8.7	9.6	9.6	8.6	7.6
COD (ppm)	7	6	4	7	5.7	4
DO (ppm)	8.7	9.6	10.5	10.5	9.6	8.7
Phosphate (ppm)	7.4	6.8	5.3	7.4	6.5	5.3
Conductivity (µs/cm)	547	482	569	569	533	482
Total Coliforms organism MPN/100 ml, Max	>1600	>1600	>1600	>1600	>1600	>1600

Table 6. Chemical and biological test results of Location 4.

Location	**4**					
Site	**Gandhi bridge**					
Parameters	**Summer**	**Winter**	**Monsoon**	**Max.**	**Avg.**	**Min.**
pH	7	6.9	6.7	7	6.9	6.7
BOD(ppm)	8.2	8.9	10.2	10.2	9.1	8.2
COD(ppm)	6	6	5	6	5.7	5
DO(ppm)	9.2	10.5	11.1	11.1	10.3	9.2
Phosphate(ppm)	6.5	6.2	5.1	6.5	5.9	5.1
Conductivity(µs/cm)	493	411	521	521	475	411
Total Coliforms organism MPN/100 ml, Max	>1600	>1600	>1600	>1600	>1600	>1600

Table 7. Chemical and biological test results of Location 5.

Location	**5**					
Site	**Subhash bridge**					
Parameters	**Summer**	**Winter**	**Monsoon**	**Max.**	**Avg.**	**Min.**
pH	6.9	6.8	6.7	6.9	6.8	6.7
BOD(ppm)	8.5	9.6	10.4	10.4	9.5	8.5
COD(ppm)	6	5	4	6	5	4
DO(ppm)	9.7	11.1	11.7	11.7	10.8	9.7
Phosphate(ppm)	6.2	5.8	5.3	6.2	5.8	5.3
Conductivity(µs/cm)	463	428	510	510	467	428
Total Coliforms organism MPN/100 ml, Max	>1600	>1600	>1600	>1600	>1600	>1600

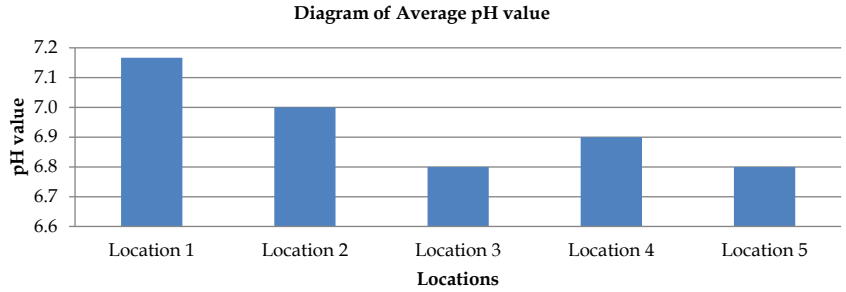

Fig. 2 Observation of average pH value.

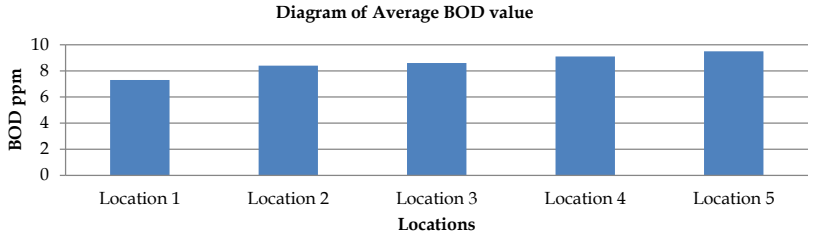

Fig. 3 Observation of average BOD value.

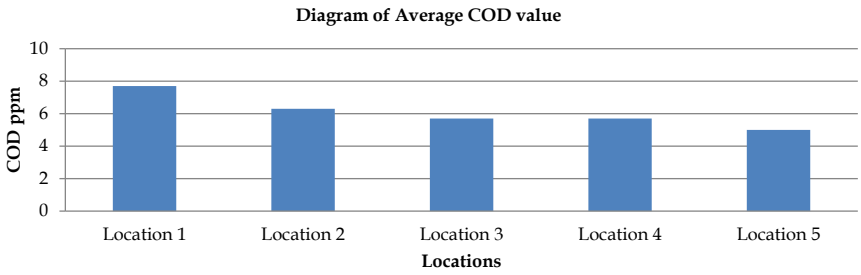

Fig. 4 Observation of average COD value.

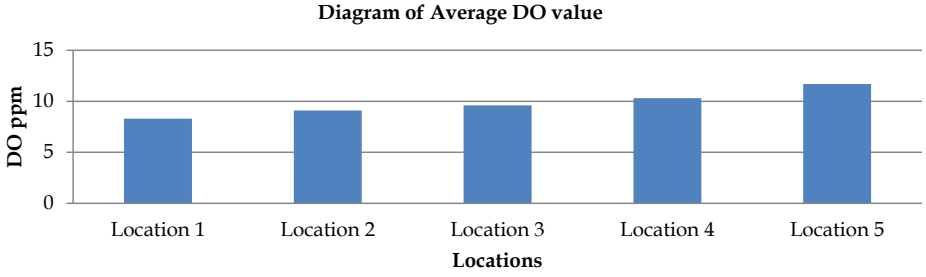

Fig. 5 Observation of average DO value.

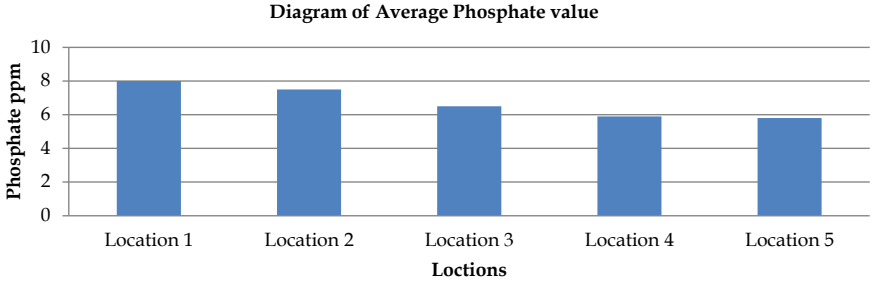

Fig. 6 Observation of average phosphate value.

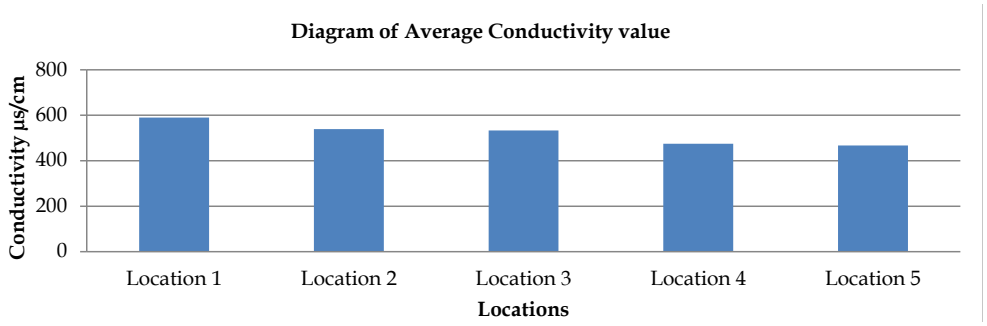

Fig. 7 Observation of average conductivity value.

CONCLUSION

Maximum value of pH, BOD, COD, DO, Phosphate and Conductivity were evaluated 7.4, 10.4 ppm, 9.0 ppm, 11.7 ppm, 9.3 ppm and 685 µs/cm respectively, Total Coliform organism MPN/ 100 ml was estimated >1600 in every locations. Seasonal analysis of physico chemical and Biological test parameters of Sabarmati River water sample does not compliance the Category A, B or C river water Classification given by GPCB which indicates the requirement of water treatment and disinfection process before use as a drinking purpose.

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