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Short Communication

Study on Physico-Chemical Characterization of Some Lotic System of South Gujarat, India

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Abstract

Physico-chemical monitoring of six rivers between Navsari District to Valsad District of South Gujarat was carried out during April-August 2010. Random sampling stations were selected for all the rivers to know the quality of flowing water as the potability of water is the matter of concern. The analysis was carried out for parameters like pH, temperature, colour, odour, DO, COD, BOD, TDS, SS, chloride, silica, total hardness, total alkalinity and phosphate. The result obtained from the present work indicates that there are diverse contaminations and pollution in River Auranga at Valsad with compared to rest of the rivers. Therefore it is unsafe to use directly for potable purpose and hence needs more attention.

Keywords: Physico-chemical, COD, DO, contamination, pollution.

Introduction

South Gujarat is called as economic capital as well as economic backbone of Gujarat. South Gujarat constitutes the areas falling between Bharuch to Umargaun (Border of Gujarat and Maharastra). Bharuch, Ankleshwar, Surat, Navsari, Valsad and Vapi are the main cities of south Gujarat. From Surat only 80% of world demand of art silk sarees compensated. There are many Industries lying in the area from Ankleshwar to Vapi in various GIDC as well as various Indusrial areas. As per climatic condition south Gujarat has moist climate having rainfall that varies from 1000 to 1600 mm/year, shallow water table and better fertile soil[1].

In present paper our study is limited to the regions that fall between Navsari to Valsad city which consists rivers like Ambika, Purna, Kharera, Dholdhara, Auranga and Par. These are only areas where very small scale and clustered industries are working as compared to Vapi, Ankleshwar and Surat. Most of the villages between Navsari and Valsad are farming as well as industrial region and people residing in villages are using bore well and river water of nearby area for drinking purpose. Although water is supplied to people through water treatment plant but some people are addicted to use the river water for drinking, recreational and bathing purpose. For such purpose many researches done in this direction[2 to 6]. The present study has been carried out to asses and evaluate the physico-chemical characteristics of all selected rivers of South Gujarat with drinking water norms laid down by WHO[7,8] and ICMR[7,8].

Material and Method

The water samples were collected from random station by Integrate sampling method. Total 30 sampling points were selected for all the rivers that means 5 sampling points for every river. The samples were collected once in a week from April 2008 to June 2008. All samples were collected in high density polypropylene bottles (Tarson make). In all case plastic bottles were cleaned properly, first with dilute nitric acid and then with double distilled water before their usage for collection of samples. During sampling sample bottles were cleaned with ambient water before taking the samples. During whole study AR grade chemicals were used. The analysis is based on APHA for examination of water and wastewater[9]. Parameters like pH, odour, and temperature were checked at the site while rests of the parameters were checked in laboratory within 6-10 hrs of time and methods for analyzing them are shown in table I. Some standard preservative media was used to preserve the samples till it use for analysis in laboratory[7].

Results and Discussion

An average physico-chemical characteristic of different rivers samples of South Gujarat collected during April 10 to August 10 are shown in table No. II. It was found that maximum temperature was observed in Ambica River - 28 °C whereas minimum temperature was at Auranga river - 25 °C. Temperature plays a crucial role in physico-chemical as well as biological process of river.

The pH of all river samples varied from 7.8 to 8.7 showing alkaline nature. Generally pH does not affect human health but variation in pH may cause change the taste of water[7]. In all the ground water samples colour was checked in Hazen unit. From the analysis it seems that all water samples having acceptable colour. Colour is not adversely affecting the water quality but colour is aesthetically not acceptable.

Alkalinity of all rivers was varied from 140 to 225 ppm. So all representative samples of river showing the alkalinity within the drinking water standards. More alkalinity needs more water softening during treatment of raw water[7,10].

Hardness from all rivers varied from 130 to 6500 ppm. All rivers except Auranga river water contain more hardness than the prescribed limit as per standards[7,8]. So the adverse effects of such water may be[7,11]

Soap consumption by hard water causes economic loss to water. Precipitation of hard water adheres to surface tube, sinks etc and may stain clothing and utensils. More hard water forming magnesium sulfate, which tends to laxative effect in person having accustomed it.

A UK nationwide study, funded by the Department of Health, is investigating unreliable evidence that childhood eczema may correlate with hard water[12].

From the result obtained, Chlorides were found within the stipulated limit for drinking water standard except Auranga River having 30771 ppm chloride. High Chloride reacts with sodium and makes water salty in taste. It also may increase TDS values of water. Chlorides are not usually harmful to people; however, the sodium part of table salt has been linked to heart and kidney disease. Sodium chloride may impart a salty taste at 250 mg/L; however, calcium or magnesium chloride is not usually detected by taste until levels of 1000 mg/L are reached[13].

As Chloride increases generally TDS increase. It also depends upon other salt content. As per study data all samples except Auranga river water contained less TDS as given by WHO and ICMA. The TDS concentration is a secondary drinking water standard and therefore is regulated because it is more of an aesthetic rather than a health hazard. An elevated TDS indicates the following[14]:

The concentration of the dissolved ions may cause the water to be corrosive, salty or brackish taste, result in scale formation, and interfere and decrease efficiency of hot water heaters; and many contain elevated levels of ions that are above the Primary or Secondary Drinking Water Standards, such as: an elevated level of nitrate, arsenic, aluminum, copper, lead, etc.

There is no limit for SS in WHO and ICMA standards[7,8]. It is a physical property of water and more SS is not acceptable as it is aesthetical asset of water. All the river water samples having negligible SS so there is no problem of SS to the public for drinking purpose. Suspended solids interfere with effective drinking water treatment. High sediment loads interfere with coagulation, filtration and disinfection. More chlorine is required to effectively disinfect turbid water[15].

COD is the main parameter to asses the quality of wastewater as it shows the oxygen requires to degrade both organic and inorganic matter present in the effluent. In water there is no standard mentioned, it means all the water source should be COD free but during the analysis we found that sample from Auranga river contained more COD i.e. 524 ppm which is too high and indicate that water quality is very bad. Rest of all river water samples contained negligible COD which can not harmful to human health.

Table-1

Sr. No.	Parameters of Water Analysis	Methods
1	pH	Potentiometric
2	Temperature	Thermometric
3	Colour	Colourimetric
4	Total Hardness	Titrimetric
5	Total Alkalinity	Titrimetric
6	Chloride	Gravimetric
7	Phosphate	Spectrophotometer
8	S.S	Gravimetric
9	TDS	Argentometric
10	COD	Dichromate Reflux

Table-2

Sr. No	Parameters	Prescribed Limit by ICMR	Prescribed Limit by WHO	Ambika river	Dholdhara river	Kharera river	Purna river	Auranga river	Par river
1	pH	7.0-8.5	6.5-8.5	8.3	8	8.2	8.7	8.1	7.8
2	Temperature	--	--	28.0	26.3	27.5	26.2	25.0	26
3	Colour	5	--	9	11	9	13	11	Nil
4	Total Hardness	300	500	150	190	140	130	6500	135
5	Total Alkalinity	--	200	185	225	165	160	140	125
6	Chloride	200	250	52.6	49.1	58.5	70.2	30771	38.4
7	Phosphate	--	--	4	5	4	4	3	2.5
8	S.S	--	--	15	12	14	10	3	2
9	TDS	500	1000	266.4	266.4	243	267.3	40680	159
10	COD	--	--	Nil	Nil	Nil	Nil	524	Nil

Note: All data except pH, colour and temperature are in ppm. Temperature in ˚C and colour in Hazen unit

Conclusion

It can be concluded from the results obtained: Auranga River contained too much total hardness than the prescribed norms and hence it needs more attention in water treatment as to use safely for domestic and drinking purpose. Chloride is also high evident in Auranga river during the course of study and chloride reacts with sodium and may pose health hazard to kidney and heart. TDS is also high in Auranga river sample and TDS is known as secondary standard for drinking so more attention is to be given for treating the water before use for any purpose, as in drinking purpose it may pose health hazard, in domestic use it may stain the sink and increase the corrosion.

As from above 3 points we can summaries that there is problem is Auranga river water only and hence we can say that self purification of the river is very low or pollution load intake may be very high as industrial zones are in the vicinity of Auranga river in Valsad district.

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