IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399. Volume 5, Issue 3 (Jul. - Aug. 2013), PP 89-92
www.Iosrjournals.Org

"Physicochemical Analysis of Water from Various Sources and Their Comparative Studies"

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Abstract: *Water is one of the most important of all natural resources known on earth. It is important to all living organisms, most ecological systems, human health, food production and economic development. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems.*

Due to these contaminants quality of the Drinking Water becomes poor. Sometimes such poor quality water causes many diseases in the humans so that quality of the water must be tested for both the chemical as well as for the microbial contaminants. During the study it was found that maximum number of physical and chemical parameter were within the desirable limit, as suggested by WHO (1971) and BIS (1991).

The objective of the present research is to provide information on the physicochemical characteristics & detailed ecological studies of Potable water and Lake water (Habitat) in order to discuss it's suitability for human consumption. Physicochemical and bio-chemical aspects of the water have been investigated to assess the quality of water. The variations of the physicochemical properties of water samples directly influence the biotic communities and primary productivity of the water bodies at different areas of Ahmedabad.

Keywords: *Potable water and Lake water, Ahmedabad, Physico-chemical and Investigation, ecological studies, Comparative studies.*

I. Introduction

Water is one of the most important of all natural resources known on earth. It is important to all living organisms, ecological systems, human health, food production and economic development. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems. Due to these contaminants quality of drinking water becomes poor. Sometimes such poor quality water causes many diseases in the humans, so that quality of water must be tested for both the chemical as well as for the microbial contaminants.

The 5 major Application of water are Hydropower**,** Domestics uses**,** Irrigation, Industrial uses, Commercial uses. The major water quality parameters considered for the examination in this study are pH, Odour, Colour, Taste, Temperature, Turbidity, Total Dissolved Solids (TDS), Dissolved oxygen (DO), Dissolved carbon dioxide, Metals and Metalloids, Total Hardness, Alkalinity.

1.2 Sample Collection:

- Potable water sample was collected from five different areas of Ahmadabad: Processed water (Water Plant, S.G. Highway), Thaltej, Navrangpura, Naroda and Shahibaug.
- Habited water sample was collected from four different lakes of Ahmadabad: Kankariya Lake, Malav Lake, Vastrapur Lake, Chandola Lake of Ahmedabad and physicochemical analysis of habited water has performed.

II. Material and Methods

The present study was carried out for five different areas and four different lakes, located in Ahmadabad city. In the present study the sampling was done during morning hours and all water samples were collected in the polyethylene bottles. For lake water sample collection the closed bottle was dipped in the lake at the depth of 0.7 to 0.9 m, and then a bottle was opened inside and was closed again to bring it out at the surface.

The samples were collected from three different points and were mixed together to prepare an integrated sample. From the time of sample collection and to the time of actual analysis, many physical and chemical reactions would change the quality of water sample therefore to minimize this change the sample were preserved soon after the collection. The water samples were preserved by adding chemical preservatives and by lowering the temperature. The water temperature, Odour, Taste, TDS were analyzed immediately on the spot after the collection, Whereas the analyses of remaining parameters were done in the laboratory. The study was carried for a period of four month (january 2012 to april 2012).The collected water samples were brought to the laboratory and relevant analysis was performed. pH was determined using pH meter, and similarly turbidity is

measured by Turbidity meter. Alkalinity, Chloride, Calcium, Magnesium, Total Hardness, Dissolved oxygen, Dissolved carbon dioxide,Barium, Copper, Sulphate was determined by method according to table (Verma Pradeep et al, 2012).

TABLE 2.1

Water quality test	Description	Instrument/ method
Temperature	Temperature exerts a major influence on the biological activities and growth.	Thermometer
Colour	The term colour is used to mean the true colour of water from which turbidity has been removed.	Platinum cobalt (visual comparision) method
Odour	Odour is recognized as a quality factor affecting acceptability of drinking water.	Wide mouth glass stoppered bottle
Taste	Taste of water ranging from agreeable to disagreeable.	By Tasting
pH	The major of acidity (hydronium ion,H+) in the water.	pH meter
Turbidity(NTU)	Turbidity in water is the reduction of transparency.	Turbidity meter
TDS	The measure of the amount of particulate solids that are in the water	TDS meter
Dissolved oxygen	The amount of oxygen available in the water.	Titrimetric method (iodometric)
Dissolved carbon dioxide	The amount of carbon dioxide in the water.	Titrimetric method
Alkalinity	Alkalinity of water is its quantitative capacity to react with a strong acid to a designated pH.	Titrimetric method
Chloride	Measurment of Chloride amount in water	Titrimetric method
Calcium	Measurment of Calcium amount in water	Titrimetric method
Barium	Measurment of barium amount in water	Titrimetric method
Magnesium	Measurment of Magnesium amount in water	Titrimetric method
Total hardness	Measurment of calcium and magnesium in water.	Titrimetric method (complexometric)
Copper	Measurment of copper in water	Spectrophotometer
Sulphate	Measurment of Sulphate in water	Spectrophotometer

III. Result

Potable Water result table 3.1

Sr. No.	Test	Processed Water Sample	Navrangpura Municipal Water Sample	Shahibaug Municipal Water Sample	Naroda Municipal Water Sample	Thaltej Municipal Water Sample
1	Temperature (ºC)	29	28	30	30	28
2	Colour (Unit)	<1	<1	<1	<1	<1
3	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	pH	6.9	7.2	7.1	7.3	7.4
6	Turbidity (NTU)	0.2	0.1	0.4	0.6	0.3
7	TDS (ppm)	150	165	156	154	159
8	Dissolved oxygen (ppm)	6.1	6.2	6.3	6.1	6.3
9	Dissolved carbon dioxide(ppm)	38	36	40	38	37
10	Alkalinity (ppm)	8	8	9	8	10
11	Chloride (ppm)	58	30	41	33	35
12	Calcium (ppm)	6.2	7	6	8	7
13	Barium (ppm)	Nil	Nil	Nil	Nil	Nil
14	Magnesium (ppm)	2.2	3	3	3.5	2.5
15	Total Hardness (ppm)	4	4.5	4.5	5	4.9
16	Copper (ppm)	Nil	Nil	Nil	Nil	Nil
17	Sulphate (ppm)	8	10	14	16	11

Lake Water result table 3.2

Sr. No.	Test	Kankariya Lake Sample	Vastrapur Lake Sample	Malav Lake Sample	Chandola Lake Sample
1	Temperature	30	29	30	31
2	Colour (Unit)	<4	<3	<2.5	<3
3	Odour	Disagreeable	Disagreeable	Disagreeable	Disagreeable
4	Taste	Disagreeable	Disagreeable	Disagreeable	Disagreeable
5	pH	8.3	8.6	8.7	8.8
6	Turbidity (NTU)	8	9	11	10
7	TDS (ppm)	900	946	987	735
8	Dissolved oxygen (ppm)	5.7	5.9	4.4	5.0
9	Dissolved carbon dioxide(ppm)	7.0	6.9	6.6	6.1
10	Alkalinity (ppm)	150	168	164	170
11	Chloride (ppm)	84	83	60	74
12	Calcium (ppm)	72	73	68.6	67
13	Barium (ppm)	41	32	31	36
14	Magnesium (ppm)	32	15.2	7.8	8.2
15	Total Hardness (ppm)	280	279	343	321
16	Copper (ppm)	19.76	15.27	17.43	15.89
17	Sulphate (ppm)	74	62	61	71

IV. Discussion

Physical parameters like Temperature, Odour, Taste & Colour was agreeable in Process and Municipal water. The general ISI standard for Drinking water's Turbidity is <0.1 NTU. Turbidity >5 NTU is considered unhealthy. In Different area of Municipal water the Turbidity ranging from 0.1 NTU to 0.5 NTU. In Naroda Municipal water, observed higher Turbidity than other area. The pH range of drinking water should far between 6.5 to 7.5 and municipal water pH observed 7 to 7.5.So it complied with the acceptance criteria of pH range & it was found to be healthy for human use. For Potable water, Dissolved carbon dioxide & Dissolved oxygen were found to be 6.4 and 33 (Average value of five different areas) respectively. TDS of water sample showed range below 1500 ppm & it complied with the given criteria of Indian standard. Minerals like Calcium, Magnesium, Chloride, Sulphate, Barium, and Copper are essential for body. Tests of these minerals were performed on potable water sample. The results complied with the given range of Test for Minerals. Alkalinity & Total Hardness of potable water should less than or equal to 10 and 300 ppm respectively. Results were complied with the given limits of both tests. Water Temperature may be depending on the season, geographic location and sampling time. As water Temperature increases, it makes it more difficult for aquatic life to get sufficient oxygen to meet it s need. Thermal pollution can cause shifts in the community structure of aquatic organisms. Turbidity of lake ranges from 4 NTU to 11 NTU. Some are naturally highly turbid but human activities have increased the levels of suspended solids in many habitats.The lake amount of Total dissolved solid recorded ranges from 668 ppm to 942 ppm. High value of suspended solid can lower the primary Productivity of system by covering the algae and Macrophytes, at times leading to almost their complete removal.The low oxygen level was recorded during summer mainly due to removal of free oxygen through respiration by bacteria and other animals as well as the oxygen demand for decomposition of organic matter. DO is the single most important gas for most aquatic organism.If the amount of free oxygen go below then 2.0 mg/l for few day in the lake containing aquatic organism it would lead the killing of most of the biota in the aquatic system. Higher value of free carbon dioxide generally coincided with minimum dissolved oxygen. Habited water is generally used by animals & birds & aquatic life. The disturbance in this biological system & ecological system may affect health of animals & birds & aquatic life. After physicochemical analysis we found that the sample of habited water is free from pollution & ecologically balanced.

V. Conclusion

The result obtained during study was compared with ISI standards. Potable water is water safe enough to be consumed by humans or used with low risk of immediate or long term harm. Habited water is generally used by animals & birds & aquatic life. The disturbance in this biological system & ecological system may affect health of animals & birds & aquatic life. After physicochemical analysis we found that the sample of Potable water and Habited water are free from pollution & ecologically balanced.

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