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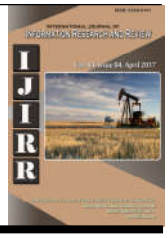

Research Article

STUDY OF PHYSICO-CHEMICAL PARAMETERS OF DRINKING WATER IN RAHATA TAHASIL (MAHARASHTRA), INDIA

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ABSTRACT

The physico-chemical characteristics of drinking water samples collected from various sites of Rahata Tahasil were assessed. The physical and chemical parameters like temperature, pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Dissolved Solids (TDS), Total Hardness, Alkalinity, Potassium (K^+), Sodium (Na^+), Fluoride (F^-), Nitrate (NO_3^-), Chloride (Cl^-) and Sulphate (SO_4^{-2}) were studied.

INTRODUCTION

Water pollution is one the world wide problem, which is directly and indirectly affecting living organisms. Effluents of various industries and domestic discharged directly or indirectly into water sources without any prior treatment for removal of harmful or dangerous compounds, create water pollution (Elizabeth, 2005 and Singh, 2006). A variety of pollutants are discharged into the aquatic bodies from several industrial sources (Yadav, 2007). Increasing demand and shortage of clean drinking water sources due to the rapid development of industrialization, population growth and long-term droughts have become a burning issue worldwide. The presence of various pollutants such as CO_2, SO_x, organic dyes, organic hydrocarbons and gasoline generated as a result of many industrial reactions has caused severe environmental problems (Yu, 2006). With this growing demand, various practical strategies and solutions have been adopted to yield more viable water resources (Malato, 2009). The pollutants like products and wastage of industries, organic matter and pathogens are polluted the drinking water. The pollution of water is a burning problem all over the globe, which requires some eco-friendly methods for its purification.

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The entire world is facing the problem of water pollution and a search is still on for the treatment of effluents of various industries. Majority of industrial houses do not give priority to the treatment of their effluents or to recycle the water. In present work the physico-chemical properties of drinking water of Rahata Tahasil was studied.

MATERIALS AND METHODS

Study Area

Drinking water samples from the selected sites of Rahata Tahasil were collected during October 2015-Janaury 2016 and taken in pre-cleaned polyethylene bottles. The samples after collection were immediately placed in dark boxes and processed within 6 h of collection. The Physico-chemical parameter of drinking water samples were studied includes temperature, pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Dissolved Solids (TDS), Total Hardness, Alkalinity, Potassium (K^+), Sodium (Na^+), Fluoride (F^-), Nitrate (NO_3^-), Chloride (Cl^-) and Sulphate (SO_4^{-2}) etc. The pH was determined by using pH meter. Other parameter determined according to Manual of Environmental Pollution (Bandela 2005).

Analysis of drinking water samples

Sample/Parameter	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Temperature (°C)	11.2	12.3	11.6	13.5	11.8	14.3	15.3	14.6	13.7	13.9
pH	7.02	7.09	7.25	7.36	7.05	7.68	7.34	7.36	7.57	7.64
Dissolved Oxygen (mg/L)	1.98	2.03	2.47	2.67	2.45	2.11	2.37	2.54	2.69	2.86
Biochemical Oxygen Demand (mg/L)	1.23	1.54	1.68	2.54	2.16	2.07	1.87	2.06	2.45	2.63
Total Dissolved Solids (mg/L)	356	378	296	547	526	557	534	512	344	576
Total Hardness (mg/L)	312.7	258.2	349.2	364.1	584.1	575.9	568.3	485.4	383.2	381.4
Alkalinity (mg/L)	144.3	135.4	125.2	127.5	135.1	113.2	114.8	137.2	113.4	122.9
Potassium (mg/L)	2.08	2.09	3.04	2.14	4.46	4.85	6.16	7.67	6.35	7.73
Sodium (mg/L)	1.03	1.07	2.14	2.26	2.07	2.18	1.96	1.97	2.13	2.67
Fluoride (mg/L)	0.02	0.03	0.02	0.04	0.03	0.06	0.03	0.02	0.05	0.04
Nitrate (mg/L)	1.03	1.07	1.11	1.08	1.24	1.13	2.02	1.74	1.68	1.96
Chloride (mg/L)	145.3	157.1	165.7	174.2	186.3	157.3	184.2	178.4	189.7	167.8
Sulphate (mg/L)	103.4	110.2	108.6	132.7	121.4	114.5	111.7	126.2	120.6	110.6

RESULTS AND DISCUSSION

Water temperature

Temperature of water if significant biological factor, it plays important role in the metabolic activities of an organism. The temperature of selected water samples is in the range of 11.2-15.3°C.

pH

It measures water quality, pH express acidic or basic nature of water. Low pH will cause pitting of pipes. At high pH water will have soda taste. The pH values of selected samples was found in the range 7.02-7.68. All selected samples were to found have pH within permissible range 6.5-8.5 (WHO, 2006).

Dissolved Oxygen (mg/L)

Dissolved oxygen reflects physical and biological parameters in the water. The selected water samples have dissolved oxygen in the range of 1.98-2.86 mg/L. All selected water samples have dissolved oxygen within permissible levels (WHO, 2006).

Biochemical Oxygen Demand (mg/L)

Biochemical decomposition is the organic matter in water decomposed by microorganisms, which use oxygen to carry out decomposition process (Young, 1981). The biochemical oxygen demand of selected water sample is in the range of 1.23-2.63 mg/L. All selected water samples have biochemical oxygen demand within permissible levels (WHO, 2006).

Total Dissolved Solids (mg/L)

The inorganic salts and small amounts of organic matter present in solution in the water are called as total dissolved solids. The total dissolved solid are due to calcium, magnesium, sodium cations and carbonates, hydrogen carbonates, chlorides, sulphates and nitrates anions (WHO, 1996). The total dissolved solids of selected water sample are in the range of 296-576 mg/L. The some of the selected water samples have total dissolved solids greater than permissible levels (WHO, 2006).

Total Hardness (mg/L): The hardness of water is due to presence of calcium and magnesium salts. The hardness of selected water samples is in the range of 258.2-584.1 mg/L. Some of the water samples have greater hardness than the permissible limits (WHO, 2006).

Alkalinity (mg/L)

It is capacity to neutralize a strong acid and it is normally due to the presence of bicarbonate, carbonate and hydroxide of calcium, sodium and potassium. The alkalinity of water samples is in the range of 113.2-144.3 mg/L. All the water samples showed alkalinity within the permissible limits (WHO, 2006).

Potassium (mg/L)

The selected water has the potassium contents in the range 2.08-7.73 mg/L. All drinking water samples have potassium within the permissible limits (WHO, 2006).

Sodium (mg/L)

The selected water has the sodium contents in the range 1.03-2.67 mg/L. All drinking water samples have potassium within the permissible limits (WHO, 2006).

Fluoride (mg/L)

The fluoride in water is arises due to the weathering process and circulation of water in rocks and soils, which results in leaching out of fluorine and its dissolution in ground water. The water samples have the fluoride in the range of 0.02-0.06 mg/L. All drinking water samples have potassium within the permissible limits (WHO, 2006).

Nitrate (mg/L)

The nitrate is introduced into the water due to sewage and other wastes rich in nitrates. The water samples have the nitrates in the range of 1.03-2.02 mg/L. All drinking water samples have potassium within the permissible limits (WHO, 2006).

Chloride (mg/L)

The chloride pollution is mainly due to sewage. The water samples have the chlorides in the range of 145.3-189.7 mg/L. All drinking water samples have potassium within the permissible limits (WHO, 2006).

Sulphate (mg/L)

The sulphate occur naturally in water is due to the result of leaching from gypsum and other common minerals. The

discharge of industrial waste and domestic sewage increases its concentration. The water samples have the chlorides in the range of 103.4-132.7 mg/L. All drinking water samples have potassium within the permissible limits (WHO, 2006).

Conclusion

The drinking water which was taken from the various places around Rahata Tahasil was analyzed and the analysis reports reveal that the drinking water quality parameters like pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), alkalinity, potassium (K^+), sodium (Na^+), fluoride (F^-), nitrate (NO_3^-), chloride (Cl^-) and sulphate (SO_4^{-2}) lies within the maximum permissible limit prescribed by WHO. The total dissolved solids and hardness of few samples were reported higher than the permissible level. It is found that some of the water samples are non-potable for human being due to high concentration of total dissolved solids and total hardness.

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