

Qualitative and Quantitative Analysis of Water Samples in Mumbai, nearby Mumbai Areas and Their Comparative Study

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Abstract

Impure drinking water is one of the significant concerns in metro cities of various countries. To deal the problems of ground water as various sources are negatively impacted by parameters of aesthetic concern, such as turbidity, conductivity, and iron content. Even though they do not affect human health, elevated levels of these parameters cause consumers to abandon improved water supply. Parameters like pH, hardness and chloride and sulphate content directly affect human health. It is need of time to find their levels before using it for any purpose. Water is essential constituent in agricultural sector for enhancing crop production, so we must redouble our efforts to increase agricultural productivity. This paper is based on study of qualitative and quantitative parameters for three different Groundwater samples at Sion, Thane & Kaylan cities in Mumbai Metropolitan Region (MMR). Ground water samples were collected in the month of September and March in the year 2018. Over the due course of time different parameters were checked for its suitability for its usage.

I. INTRODUCTION

Water plays an important role in the various life processes in human bodies. Water quality is of vital concern for living beings as it is directly linked to human life. Rapid industrialization, unscrupulous population, depletion of natural resources and scarcity of potable water affecting economic growth of India. Most of the freshwater bodies all over the world are getting polluted, thus decreasing the availability of potable water. Entire human life is dependent on quality of water. Various sources available in nature are many. Examples are rainwater, underground water, lake water, river water, sea water, clouds, ice crystals and fog etc. Unfortunately, availability of chemically pure water is for short duration of time in nature. Water plays key role in building the land and controlling the climate. In addition to rapid industrialization, urbanization even indiscriminate usage of synthetic fertilizers, pesticides include insecticide, fungicides, herbicides used in agriculture are responsible for

pollution in aquatic environment leading to the deterioration of water quality and depletion of aquatic life. It's requirement to check the water quality at the regular time interval on priority basis as contaminated water is basic origin for many water-borne diseases. Parameters required to be tested are hardness, pH, turbidity, conductivity, chloride, sulphate content. As water is important and essential for the survival of any living creature on the earth. It is a necessary requirement to study chemical, physical & biological properties of water before using it for any purpose. Ground water contains colloidal, suspended, dissolved gaseous, bacterial, and chemical impurities. If impurity percentage is beyond the standard tolerance limit, it will adversely affect all living beings. In this study focus is on following different parameters for the water samples cited above

- Determination of Hardness
- Determination of pH
- Measurement of Chloride content

- Measurement of Turbidity
- Measurement of Conductivity
- Determination of Iron content
- Determination of Sulphate content.

II LITERATURE REVIEW:

Water is life for all living beings. So, it should contain required constituents within standard limits. If any constituents are present in excess amount, it adversely effect on the Biotic as well as Abiotic life on the earth. In 2008, Indrani Gupta, Shivani Dhage and Rakesh Kumar [1] analysed the water samples in different coastal area of Mumbai. It was found that the coastal area water is more polluted due industrial waste. In 2010, Swapnil R Kamble, Ritesh Vijay and R. A. Sohany[2] studied the water quality of sewage and waste water in the coast, creeks and beaches by GIS based analysis. They compared quality of water in winter and summer season. In Dec-2013, S.P. Gorde, M.V. Jadhav[3] measures the important parameters like pH, Conductivity, Alkalinity, Phosphate, Nitrogen contents, DO, BOD and COD. They studied the water quality index (WOI) of lake water indicated that during summer season, lake water is more affected than winter. When the temperature is low activity of microorganism is at decreasing level. In July 2014, James S. Pushpam K. V. from VJTI, Mumbai, [4] checked the ground water quality for construction of part of Mumbai metropolitan region (MMR). They had collected fifteen water samples from different areas and tested for different parameters in the ground water. According to their analysis the ground water (except Vasai and Virar) is fit for construction. In June 2015 study on hardness of ground water using EDTA was checked by P Ramya, A.Jagdishbabu, ETirupati Reddy and L VenkateshwaraRao and as per their study hard water is not harmful to health but very hard water is harmful to human health [5]

III OBJECTIVES:

To assess pollutant concentrations, physical, chemical, and biological characteristics of the water samples and the toxic effects of the water to human health. To maintain appropriate levels of environmental quality and to control activities that can badly affect the environment

IV EXPERIMENTAL DETAILS:

1. Hardness value:

Hardness of water is measured by complexometric titration 50 ml of water sample is taken in conical flask in which 2/3 test-tube buffer solution is added for alkaline (pH) ,4-5 drops of EBT indicator is added in it at the end and whole solution is titrated against EDTA till wine red color changes to sky blue. By comparing with standard water sample hardness is calculated [6]

pH value:

All three samples are checked for their acidic or alkaline or neutral pH values by using the pH meter. [6]

2. Turbidity:

Distilled water is considered as standard sample and turbidity of distilled water is measured by turbidity meter. If the turbidity is not zero. Then the setting need to be adjusted as to make it zero. The same procedure is repeated for all the samples. [6]

3. Conductivity:

KCl is used as standard and conductivity is measured using conductivity meter. If required, accordingly conductivity meter is standardized. Then, conductivity of the sample is checked. The same procedure is repeated for all the samples. Then conductivity of remaining samples is recorded. [6]

4. Chloride content in water:

First, a standard NaCl and Standard AgNO₃ solutions are prepared. AgNO₃ solution is

standardized with the NaCl Solution. Potassium Chromate indicator is used as indicator. AgNO₃ solution is added until slight red precipitate is formed. It is allowed to stand for a few hours & then, it is filtered. The filtrate is diluted to 1000 ml. 20 ml of sample is taken in a flask. One ml of the indicator is added to obtain yellow color. The sample is titrated against the silver nitrate solution until a brick-red color is obtained. [6]

6. Sulphate content in water:

Preparation method for conditional reagent is as mentioned below

ml of glycerol is taken in a beaker +15 ml of con. HCl + 50 ml of ethanol is added to the same beaker. + 37.5 g of NaCl is dissolved in distilled water & the total volume is made to 250 ml.

Preparation method of sodium sulphate- solutions of different concentrations of 50 ml volume are prepared as given below In the beginning blank Solution is prepared –

0.2 g/l

0.4 g/l

0.6 g/l

0.8 g/l

50 ml of all the three samples are also taken. Then, five ml of reagent is added to all the solutions. A pinch of barium chloride is added to all the solutions. Then absorbance of all the samples is taken by using spectrophotometer [6]

7. Iron content in water:

0.125 g/l concentration iron solution was taken. Six solutions of a different concentration (20 ml each) were prepared. In the beginning blank solution is prepared 0.025 g/l

0.05 g/l

0.075 g/l

0.1 g/l

0.125 g/l

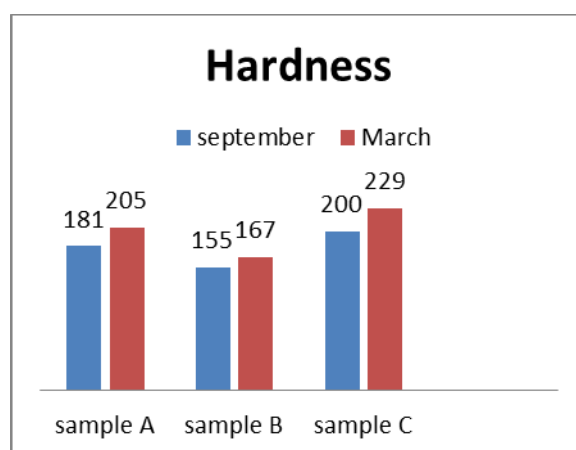
20 ml of each sample was taken. Phenanthroline & Hydroxylamine Hydrochloride were added to all the solutions. By using spectrophotometer absorbance of all the solutions were measured at 510 nm. [6]

V OBSERVATION AND RESULT

Sample A	Water sample at Sion
Sample B	Water sample at Thane
Sample C	Water sample at Kalyan

1. Determination of Hardness by EDTA

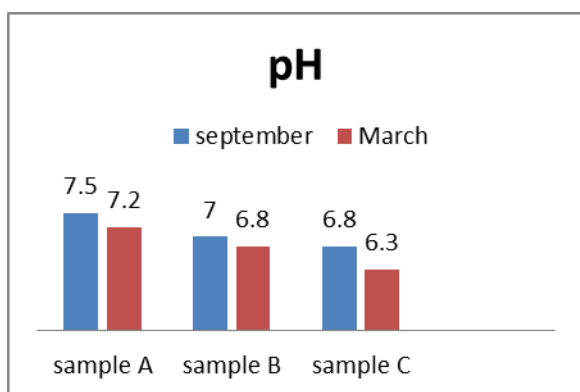
	September		March	
s	Hardness in ppm	Type of hardness	Hardness in ppm	Type of hardness
Sample A	181	Moderately hard	205	Moderately hard
Sample B	155	Very soft	167	Moderately soft
Sample C	200	Hard	229	Hard



Result: As per the above observations of samples in terms of hardness sample B shows less dissolution of solids in comparisons with sample A and C. In summer season slight increase in hardness is observed.

2. Measurement of pH

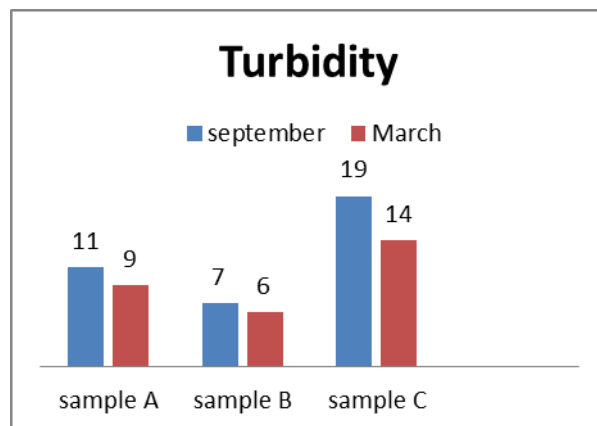
Water sample	September		March	
	pH	Nature of water	pH	Nature of water
Sample A	7.5	Slightly basic	7.2	Slightly basic
Sample B	7	Neutral	6.8	Slightly acidic
Sample C	6.8	Slightly acidic	6.3	Slightly acidic



Result: There is no change in nature of the water only slight changes in pH are observed. Sample B is showing pH around seven where Hydronium and hydroxyl ions are exactly balanced so water sample almost neutral in nature. Sample A is showing alkaline pH due to more concentration of hydroxyl ions. Sample C is showing acidic pH due to more concentration of hydronium ions.

3. Measurement of Turbidity

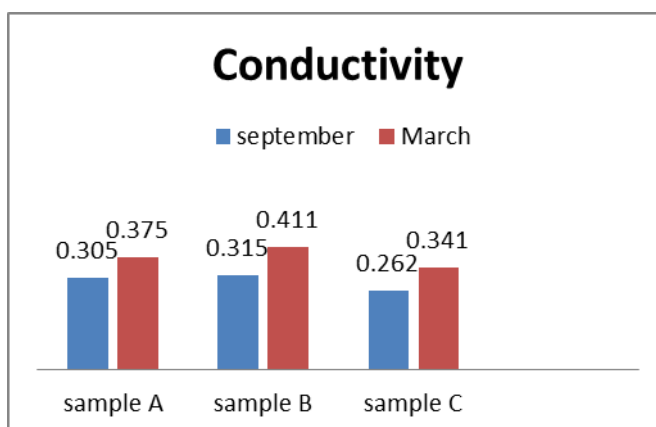
Water sample	September		March	
	Turbidity	Turbidity level	Turbidity	Turbidity level
Sample A	11 NTU	Medium	9 NTU	Medium
Sample B	7 NTU	Low	6 NTU	Low
Sample C	19 NTU	High	14 NTU	High



Result: In rainy season turbidity is more whereas it decreases in summer season. Sample B is showing low turbidity in comparisons with high turbidity of sample C and medium turbidity of sample A.

4. Measurement of Conductivity

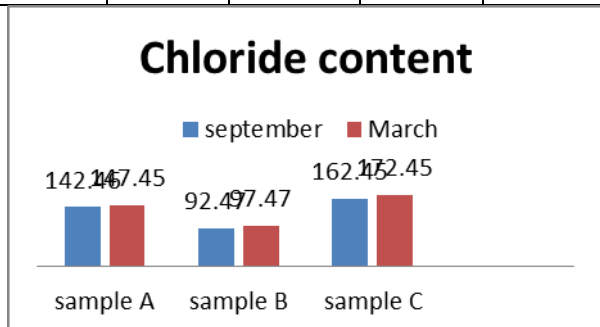
Water sample	September		March	
	Conductivity in Ms/cm	Observed Conductivity	Conductivity in Ms/cm	Observed Conductivity
Sample A	0.305	Medium	0.375	High
Sample B	0.315	Medium	0.411	High
Sample C	0.262	Low	0.341	Medium



Result: Conductivity is high for all three samples in March whereas conductivity is low for all three samples in September

5. Determination of chloride contents

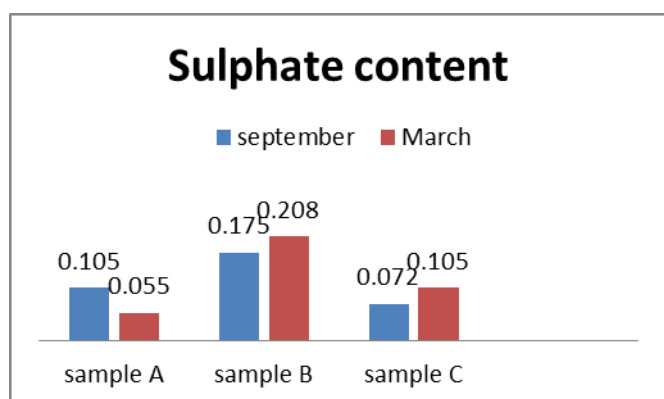
Water sample	September		March	
	Chloride contents in mg/lit.	Amount of chloride ions	Chloride contents in mg/lit.	Amount of chloride ions
Sample A	142.46	Moderate	147.45	Moderate
Sample B	92.47	Less	97.47	Less
Sample C	162.45	High	172.45	High



Result: Sample B shows presence of lesser amount of chloride ions, sample C shows presence of more amounts of chloride ions where as sample A shows presence of moderate amount of chloride ions.

6. Determination of sulphate contents

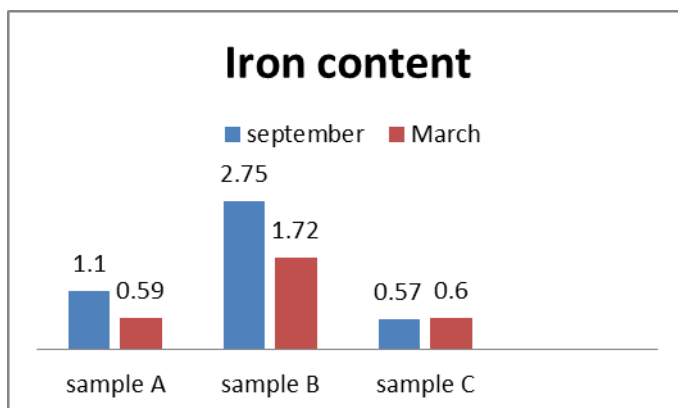
Water sample	September		March	
	Sulphate contents in gm/lit.	Amount of Sulphate ions	Sulphate contents in gm/lit.	Amount of Sulphate ions
Sample A	0.105	Moderate	0.055	Less
Sample B	0.175	High	0.208	High
Sample C	0.072	Less	0.105	Moderate



Result: For sample A in summer season sulphate ions contents are less than the winter season. In sample B sulphate ions contents are high in both summers as and in winter season. In sample C sulphate ions contents are less in winter and summer season.

7. Determination of Iron contents

Water sample	September		March	
	Iron contents in mg/lit.	Amount of Iron ions	Iron contents in mg/lit.	Amount of Iron ions
Sample A	1.1	Moderate	0.59	Moderate
Sample B	2.75	High	1.72	High
Sample C	0.57	Less	0.6	Less



Result: For sample A in summer as well as in winter season iron ions contents are moderate. In sample B iron ions contents are high in both summers as well as in winter season. In sample C iron ions contents are less in winter as well as in summer season.

VI CONCLUSION

As per above analysis with respect to all above mentioned parameters, it is concluded that quality of water in Thane region is superior, quality of water in Kalyan region is inferior and quality of water in Sion region is tolerable

In summer season hardness value, conductivity value and chloride contents are in increasing order. Turbidity, pH, percentage of sulphate and iron are in decreasing order.

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