

STUDY OF SEASONAL VARIATIONS IN PHYSICOCHEMICAL PARAMETERS OF VEHAR LAKE MUMBAI, INDIA.

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Abstract: Due to over population, negligence and exploitation of fresh water bodies, signs of water scarcity are seen in every corner of the world. Water supply has been a serious problem ever since people started living in towns and cities. The history of Mumbai water supply dates back to 1860, which started from Vehar Lake. For more than 150 years Vehar Lake is fulfilling quench of Mumbai's population. To keep the water potable is a huge task for Municipal Corporation of Mumbai. It is necessary to study quality of water on a regular basis. This paper provides current water quality of Vehar Lake.

Keywords: scarcity, Vehar Lake, quench, Municipal Corporation

1. INTRODUCTION:

Earth's surface is covered with almost 71% water and out of this 97% is salty, which is unfit for consumption [11]. Over one billion people still lack access to safe drinking water and nearly two billion, lack safe sanitation [13]. So, the availability of quality water must be considered as a boon to human beings [5].

Mumbai water supply has taken a great leap from 30 million litres/day in 1860 to 3100 million litres/day in 2006. This race against the ever increasing water demand still continues as BMC water engineers are now starving for 5000 million litres / day by year 2021 [11].

Uninterrupted water supply is a vital component of civic infrastructure of the city. The founders of Mumbai had recognized Mumbai's potential as commercial centre and started developing Mumbai's water supply facilities as early as 1860. The water in Mumbai is brought from long distance and supplied after being filtered to international standards. Harnessing the water is necessary because the resources are limited [7].

Our hydraulic engineering department is among the foremost buffers of the civic budget and revenue. It is the most vital component of the civic services. The changing face of the economy, globalization, growing consumer's awareness has necessitated this department to shift its paradigm from merely a water supply body [10].

Unpolluted lakes such as Vehar and Tulsi which are located inside the Sanjay Gandhi National park have high transparency, less fluctuation in DO and high aquatic life [9].

The Vehar Lake is situated in the Island of Salsette about 18 miles to the North of Mumbai. It is formed by damming three valleys with earth embankments. The construction of Vehar Lake started in 1856 and completed in March 1860 (2006 pp14-35). Total capacity of lake is 9120 million gallons with Catchment area of 2883 acres, excluding the lake area which is 1800 acres.

This work deals with the analysis of physicochemical parameters like colour, taste, odour, transparency, total alkalinity, nitrate, salinity, sulphate and phosphate.

2. METHODOLOGY:

Study area: Water samples were collected from Vehar Lake from three different places between 8.00 AM and 10.00 AM every month from October 2016 to May 2017. Collected samples were kept in clean brown coloured glass bottles with capacity 250ml. Colour, taste, odour, and transparency measured at the time of collection and for rest of the estimations, water samples were brought to the laboratory. Water parameters like total alkalinity, phosphate, nitrate and sulphate were analysed by standard laboratory method [3]. All samples were kept in refrigerator with proper labelling till further use. All results are mentioned in **Table-I**.

3. RESULTS AND DISCUSSION

Colour: The term 'colour' refers to the natural colouration occurring of waters and not to any induced colouring resulting from waste material [4]. Water of Vihar Lake is colourless, indicating it is free from any inducing colour and waste material.

Taste and Odour: A strong odour from water for consumption will obviously cause rejection on the part of the consumer. Decomposition of organic matter in the polluted waters by the aerobic bacteria increases the Biochemical Oxygen Demand (BOD) leading depletion of Dissolved Oxygen (DO) in water. This leads anaerobic decomposition, giving an unpleasant taste and odour to water [6]. It is due to volatile organic compounds with organoleptic effect [8]. Water of this lake was free from any unpleasant odour indicating water is free from any major pollutant.

Transparency: Transparency of water Total Solids (TS), Total Dissolved Solids (TDS) and Total Suspended Solids (TSS). It is measured by simple instrument known as Secchi disc. Water of this lake was colourless and transparent indicating TS, TDS and TSS were in negligible amount.

Alkalinity: It acts as a buffer, protecting the water and its life forms sudden shifts in pH [12]. Alkalinity is not a pollutant parameter but rather is a means of the water to withstand changes in pH or buffering capacity of the water [14]. Alkalinity is calculated by titration method phenolphthalein alkalinity and methyl orange alkalinity [1] [2]. **Table-I**

Phosphates: Phosphates are chemical compounds containing phosphorus. It is non metallic elements necessary for life [13]. Run-off and sewage discharges are the important contributors of phosphorus to surface water [12]. Values of phosphate show water is free from sewage waste.

Nitrate: Relatively less of the nitrate found in natural waters. It is of mineral origin, as well organic or inorganic sources like waste and chemical fertilizers Standard value of nitrates is 50mg/1N [12]. Negligible amount of nitrates is found in Vihar Lake water. **Table-I**

Sulphate: Determination of sulphate is done by turbidimetric method [1] [2]. Range of sulphate was between 0.1-0.3 mg/ml, indicating very less amount of sulphate is present in this lake water.

Conclusion: Range of all parameters studied during this investigation was within permissible range by BIS (1993) [4] and ISI (1993) [8]. It indicates Vihar Lake water is potable, and great care is taken by Municipal Corporation of Mumbai.

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Table-I: Physico-chemical Parameters of Vehar Lake water

Parameters	October	November	December	January	February	March	April	May
Colour. Transperant (T)	T	T	T	T	T	T	T	T
Transparency (cm)	114	97	118	113	117	107	105	92
Conductivity (µmhos/cm)	30	39	28	38	34	37	29	26
Total Alkalinity (mg/L)	23	29	22	23	21	23	25	16
Total Hardness (mg/L)	11	13	11	14	13	12	15	13
Phosphate (mg/ml)	0.1	0.3	0.1	0.0	0.1	0.2	0.2	0.6
Sulphate (mg/L)	0.01	0.03	0.04	0.02	0.01	0.03	0.02	2.1
Nitrate (mg/L)	0.1	0.00	0.05	0.03	0.02	0.02	0.3	2.01