

Water quality analysis at selected sampling stations of Pavana River of Pune District, (Maharashtra), India.

Shivaji Jadhav^{1*}, Mrunalini Jadhav²

¹Basic Science & Humanities Department, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Dhankawadi, Pune 411043, (Maharashtra), India.

²Department of Civil Engineering, STE'S, Sou. Venutai Chavan Polytechnic, Ambegaon, Pune. (Maharashtra) India.

Abstract: Water is one of the most abundant commodities in nature but is also the most misused one. Although, Earth is a blue planet and 4/5th of its surface is covered by water; but important fact from this is about 97% of it is locked in the oceans, which is not suitable for drinking purpose and for direct use for agriculture as well as industrial purposes. Hence, by considering other criteria's only 0.3% of the world's water resources that man can tap for domestic, agricultural, and industrial use. The quality of drinking water is a powerful environmental detriment of health. Assessment of water quality of drinking water supplies has always been paramount in the field of environmental quality management. Assurance of drinking water safety is a foundation for the prevention and control of water borne diseases. Pavana river water quality has a special significance since it is the only major source for domestic use for the residents who are staying on the bank of the river. In this work we have estimated the river water quality for drinking purpose. The various parameters for river water quality are analyzed and these are compared to established standards. The obtained results indicate that the quality of water slightly deviate from the potable conditions.

Keywords: Pavana River; water analysis; drinking water; water born disease

Introduction

River water (Pollution Status):

Out of many essential elements for the survival of human beings, plants and animals, water is rated to be of the greatest importance. Hence, we can say that water is nature's most wonderful and most useful compound [1]. Water is an essential resource for all life on the planet. The demand for water has increased over the years and this has led to water scarcity in many parts of India as well as world. It is one of the most important compounds to the ecosystem. Physical, chemical and biological characteristics of water determine the quality of water. The water gets polluted due to increased human activities; excessive use of fertilizers in agricultural area as well as increased industrialization.

The aquatic resources are causing heavy and varied pollution in aquatic environment leading to poor of water quality and its depletion [5]. When fresh

water is artificially supplemented with nutrients; it results in an abnormal increase in the growth of water plants. This is nothing but eutrophication [6]. Generally, the discharge of waste from industries, agriculture and urban communities into water bodies stretches the biological capacities of aquatic systems [7, 8]. Agricultural runoff from fields also adds nutrients to water. But, excess of nutrients causes the water body to become choked with various organic matters which exceeds the capacity of the microorganisms in water body [9]. It breaks down and recycles the organic matter, it affects the rapid growth or blooms of algae. Due to these activities, the water becomes deficient in oxygen [10].

Materials and Methods

Water samples were collected from selected sampling stations of river Pavana between April 2018 to May 2019. Samplings commenced in the morning

*Corresponding Author:

Dr. Shivaji Jadhav,

E-mail: sdjadhav49@gmail.com

8.00 hrs and were completed by 11.00 hrs. The water samples were collected in a pre-cleaned polythene bottles of two liters capacity and stored in the refrigerator for further use.

The samples were analyzed for physical and chemical water quality parameters mentioned by using standard methods given by APHA [1].



Figure A: Pavana River



Figure B: Discharge of Industrial Effluents



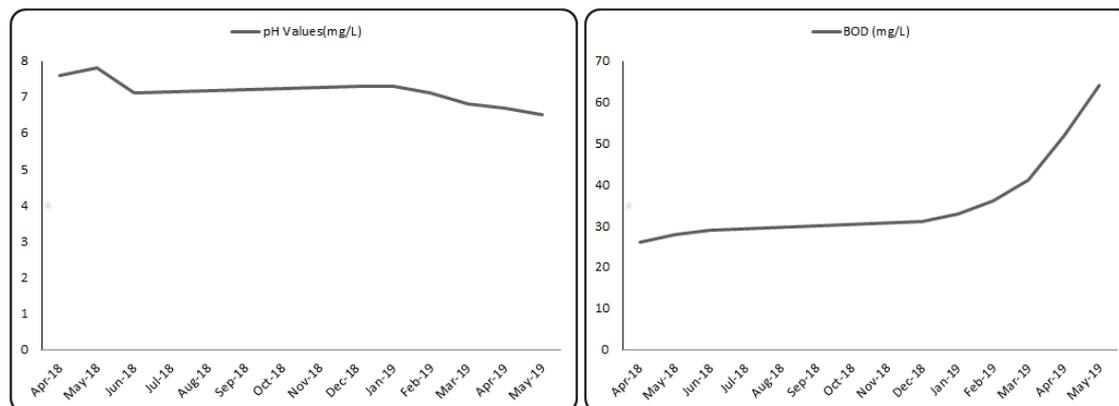
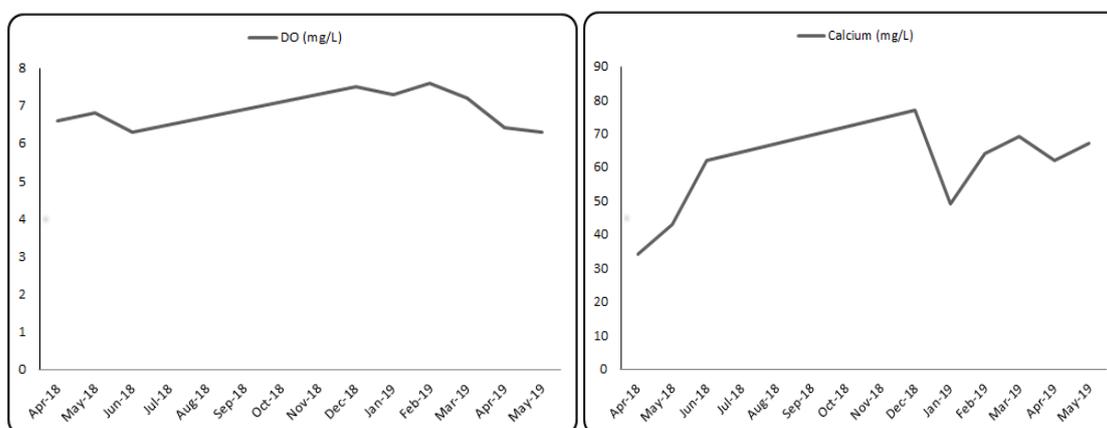
Figure C: Chemical waste in river

Table 1: Parameters studied and methods used with Indian Standards

Sr No	Parameters	Method adopted	Indian Standard
1	pH	Electrometric Method	6.5-8.5
2	DO (mg/L)	Azide modification	7.6-7.0
3	BOD (mg/L)	Azide modification	30
4	COD (mg/L)	Dichromate reflux	250
5	Chlorides (mg/L)	Argentometric Titrimetric method	250
6	Sulphates (mg/L)	Colorimetric Turbidimetric method	200
7	Nitrates (mg/L)	Colorimetric Turbidimetric method	45
8	Calcium (mg/L)	EDTA Titration Method	75
9	Magnesium (mg/L)	EDTA Titration Method	30
10	Hardness (mg/L)	EDTA Titration Method	300

Table 2: Physico-chemical parameters of Pavana River

Month	April 2018	May 2018	June 2018	Dec 2018	Jan 2019	Feb 2019	March 2019	April 2019	May 2019
pH	7.6	7.8	7.1	7.3	7.3	7.1	6.8	6.7	6.5
DO (mg/L)	6.6	6.8	6.3	7.5	7.3	7.6	7.2	6.4	6.3
BOD (mg/L)	26	28	29	31	33	36	41	52	64
COD (mg/L)	114	236	268	156	167	147	164	196	267
Chloride (mg/L)	56	124	143	92	124	206	224	231	278
Nitrate (mg/L)	28	31	26	24	21	26	28	32	37
Sulphate (mg/L)	23	21	26	27	21	19	17	18	16
Calcium (mg/L)	34	43	62	77	49	64	69	62	67
Magnesium (mg/L)	26	29	24	28	31	41	38	33	36
Hardness (mg/L)	56	78	132	119	96	114	126	142	125

Graphical representation of all the parameters:**Figure: pH Graph and BOD Graph****Figure: DO Graph and Calcium Graph****Results and Discussion**

pH scale, when hydrogen ion concentration increases, water becomes acidic and pH value reduces. pH measurements are important in medicine, biology, chemistry, agriculture, forestry, food science, environmental science, oceanography, civil engineering, chemical engineering water treatment & water purification plants and many other applications. Here in this case we are getting the pH values in the range from 6.5 to 7.8.

Dissolved oxygen (DO) is a relative measure of the amount of Oxygen that is dissolved or carried in a water body. Dissolved oxygen levels are depending upon the physical, chemical, and biochemical activities prevailing in the

water body [11,12]. It is necessary to know the DO levels to assess quality of raw water and to keep a check on stream pollution. It is the basis of BOD test, DO is necessary for all aerobic biological waste water treatment process [15]. DO test used to control amount of oxygen in boiler feed water as it is the important factor in corrosion [13,14]. Here observed values are 6.3 to 7.6 mg/L.

The amount of the oxygen required to carry the biological decomposition of organic matter in sewage under aerobic conditions at standard temperature is known as Biochemical Oxygen Demand (BOD) [16]. The range of possible readings can vary considerably water from an exceptionally clear lake might show BOD of less than 2 ml/L of water. Raw sewage

may give readings in the hundreds and food processing wastes may be in the thousands. Our readings are in the range from 26 to 64 mg/L.

COD is a measure of any kind of oxidizable impurities present in the sewage. COD is a measure of both the biologically oxidizable and biologically inert organic matter present in the sewage sample. It is an important and quickly measured parameter for steam and industrial waste water analysis and water treatment plant. Observed COD values are in the range from 114 to 267 mg/L.

The chloride and sulphate of this river water were not high. The amounts of chloride found in the sample did not exceed the maximum permissible limit i.e. 500 mg/L for drinking water prescribed by WHO. The presence of sulphate has less effect on the taste of water compared to the presence of chloride. The desirable limit of sulphate in drinking water prescribed by ICMR is 200-400 mg/L. All the water samples collected from the river have satisfied the drinking water quality so far presence of sulphate is concerned. Likewise, for the remaining parameters like calcium magnesium and hardness, the observed values are within the limit of WHO [9].

Hardness is defined as characteristic of water that represents the total concentrations of just the calcium and magnesium ions expressed as calcium carbonate. This hardness is caused due to the presence of sulphates, chlorides and nitrates of calcium and magnesium [17]. Hardness of the river water or any stream is due to bathing activity, washing clothes at the bank of rivers, disposing of untreated waste from the chemical factories making the detergents and presence of Dhobi Ghats increases the hardness of the water [18]. Our readings are in the range from 56 to 142mg/L.

Conclusion

After analyzing all the parameters of Pavana river water, it is observed that river water did not exceed the maximum permissible limit given by WHO. Some of the parameters are showing the higher values at some stations due to the entry of foreign bodies in to the river body. Otherwise, all parameters are within the desirable limits of WHO.

Acknowledgement

The authors are thankful to the Hon. Dr. Shivajirao Kadam Sir and Dr. K. D. Jadhav for constant encouragement and facilities provided. The authors would also like to express sincere thanks to the members of the University Authorities for their active support during the course of the work.

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Source of support: Nil

Conflict of interest: None Declared