

# EVALUATION OF WATER QUALITY IN VASHISHTI RIVER USING PHYSICOCHEMICAL PARAMETERS

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## ABSTRACT

Present paper assesses the study of physico-chemical parameters of Vashishti river water in Chiplun, District: Ratanagiri, Maharashtra. Monthly changes in physical and chemical parameters such as temperature (°C), pH, free carbon dioxide, dissolved oxygen, phosphate and nitrates were analyzed for period of one year from 1<sup>st</sup> December 2008 to 31<sup>st</sup> November 2009. All Parameters were within the permissible limits. The result indicates that the river water is non-polluted and can be used for domestic, irrigation and pisciculture purpose.

**KEYWORDS:** Physico-chemical parameters, monthly variations, VashishtiRiver.

## INTRODUCTION

Water is an absolutely essential component for the maintenance of life on the earth. It is one of the most unusual natural compounds found on the earth. Vital natural resource which forms the basis of all kinds of life is water. It is also key resource in all economic activities right from agriculture to industries. For both, natural ecosystem and human development, water resources have critical importance. It is a vital factor of life and is considered as a precious compound on the earth. The water is used for domestic purpose, washing, agriculture and for industries. The water is polluted when it changes its quality or composition, directly or indirectly by human activities, it becomes less suitable for drinking, domestic use, agriculture purpose, fisheries and for other purposes for which it would otherwise be suitable in its natural state (Odum, 1971). One of the important natural resources is water, it has many conflicting demands. The skillful management of water bodies is required if it is to be used for diverse purpose as domestic and industrial supply, fisheries, transport, irrigation, recreation, sport, commercial power generation and for waste disposal. Water pollution is generally associates with the discharge of effluents from drains, sewage treatment plants, and factories to the different water bodies such as of lakes, rivers, and seas. The quality of water deteriorates mainly because of human activities. Such activities possibly lead to water pollution. This pollution is such as urbanization, industries, mining, agriculture, power stations and transport (Van Vuren, et. al., 1999). Now days it is assumed that to survive mankind as today's way of life, it is necessary to increase our knowledge about the

environment and acquire concomitant behaviour patterns to safeguard the proper functioning of the ecosystem. First of all the analysis of aquatic network is the measure of the healthiness of the surrounding area. Water pollution becomes most evident when it involves poisoning of drinking water or causes the death of a large number of fish or other aquatic organisms, which could be caused by sewage and industrial effluent. Disposal of sewage wastes and industrial effluents into a large volume of water could reduce the biological oxygen demand to such a great level that the entire oxygen may be removed. This would cause the death of all fish species (Water facts, 1997).

## **MATERIALS AND METHODS**

The River Vashishti has a course of about 50 Km and becomes tidal near Chiplun below the island Govalkot. The river widens and meets the Arabian Sea after course of 40 Km at Dabhol. The water sample from study station was collected in the morning hours between 9.00 to 11.00 am, in polythene bottle regularly for every month to assess the water quality during the period from December, 2007 to November, 2008. The water samples were immediately brought to the laboratory for estimation of various physico-chemical parameters. Parameters like water temperature and pH were recorded at the time of sample collection, by using thermometer and pocket digital pH meter. While other parameters such as DO, Free CO<sub>2</sub>, phosphate and nitrate were estimated in the laboratory, by using standard methods prescribed by APHA, (1985), Kodarkar (1992), Trivedy and Goel, (1986).

## **RESULTS AND DISCUSSION**

The water samples from study station showed variations in temperature from 26 °C to 28.5 °C with average of 26.7 °C. The pH values indicated acidic nature of water samples with and range between 6.40 to 7.33 and average of was 6.99. The maximum concentration of free carbon dioxide 16.10 mg / l was recorded at study station in the month of December 2008. While the minimum concentration of 3.00 mg / l was recorded in the month of March 2009 and average was 9.37 mg / l. The dissolved oxygen content varied between 6.70 to 10.72 mg / l. The dissolved oxygen was recorded at minimum level 6.70 mg / l in the month of February 2009. Inorganic phosphate and nitrate content of water samples were 2.25 to 5.00 mg / l and 1.24 to 17.50 mg / l respectively.

In the present study temperature of water samples showed variations in the range of 26 °C to 28.5 °C. The measurement of temperature in water is important basically for its effect on the chemistry and biochemical reactions in the organisms. The atmospheric temperature generally varies between 10 °C to 35 °C in a year.

The pH of water drastically changes with time because of exposure to air, temperature changes and biological activities. Significant change in pH occurs due to disposal of industrial wastes and acids in drainages (Trivedy and Goal, 1986). The pH of natural water varies around seven (i.e. alkaline). High pH is

unfavorable to aquatic organisms. Beyond 8.5 pH, water will affect the mucous membrane and / or water supply system (Das, 1978). In the present investigation pH ranged from 6.40 to 7.33.

Carbon dioxide is commonly found in water from photosynthesis and decomposition of organic matter. Excessively high levels of Carbon dioxide (Greater than 20 ppm) may interfere with the oxygen utilization by the fish. (Sawane, et. al., 2006) reported the inverse relationship between pH and Carbon dioxide.

In the present study, minimum concentration of free carbon dioxide (3.00 mg / l) was recorded at study station in the month of March, 2009. Carbon-dioxide accumulates in water due to microbial activity and respiration of organisms. In summer, with increase in atmospheric temperature, there was corresponding rise in water temperature and consequent increase in biological oxidation of organic matter that might have caused an elevation in level of carbon dioxide (Singh and Srivastava, 1988).

**Table 1: Physico - chemical parameters of Vashishtiriver water**

<b>Month</b>	<b>Temp. ( °C )</b>	<b>pH</b>	<b>Free Carbon dioxide (mg/lit)</b>	<b>Dissolved Oxygen (mg/lit)</b>	<b>Phosphate content (mg/lit)</b>	<b>Nitrate content (mg/lit)</b>
<b>Dec-08</b>	26.5	6.80	16.10	9.50	2.25	BDL
<b>Jan-09</b>	26.0	7.17	10.20	10.20	3.50	BDL
<b>Feb-09</b>	27.0	7.13	4.40	6.70	4.50	2.00
<b>Mar-09</b>	27.0	6.50	3.00	8.00	5.00	1.50
<b>Apr-09</b>	28.0	7.10	3.50	8.33	2.50	BDL
<b>May-09</b>	28.5	6.60	4.50	8.17	2.50	BDL
<b>Jun-09</b>	26.5	7.20	6.70	10.39	3.00	2.00
<b>July-09</b>	26.5	7.13	7.50	9.95	3.50	15.00
<b>Aug-09</b>	26.0	6.40	14.71	10.72	2.75	17.50
<b>Sep-09</b>	27.0	7.20	12.19	6.83	4.50	12.50
<b>Oct-09</b>	26.0	7.33	14.18	10.12	2.25	15.80
<b>Nov-09</b>	26.5	7.27	15.40	7.90	3.50	14.15
<b>Average</b>	26.7	6.99	9.37	8.90	3.31	6.70

Dissolved oxygen (D.O.) is very important parameter to assess the quality and is an index of physical and biological processes going on in the water. The sources of oxygen in water are mainly by two ways, either from atmospheric diffusion or from photosynthetic activities. Dissolved oxygen is a key parameter reflecting the quantity of water and hence used in classifying the water quality, which receives the wastes. Its presence is essential to maintain biological life in water.

Dissolved oxygen is one of the important factors in water quality assessment. Its presence is essential in aquatic ecosystem in bringing out various biochemical changes and its effects on metabolic activities of organisms. The oxygen balance of the system largely determines the effects of waste discharged in water body. Non - polluted surface waters, remain saturated with dissolved oxygen. Dissolved oxygen levels in natural and waste waters are dependent on physical, chemical and biological activities primarily by three factors Viz. Free diffusion of atmospheric oxygen, Oxygen production through photosynthesis, and Dissolved oxygen consumption by plants, animals and decomposers.

In the present study, minimum 6.70 mg / l, and maximum 10.72 mg / l, D.O.contents was recorded in the months of February and August 2009, respectively at study station. The dissolved oxygen was as recorded at minimum levels in the month of, February 2009.

In aquatic ecosystem phosphate-phosphorus plays an important role as a nutrient. Nitrates, domestic sewage, industrial effluents, detergents are the main sources of phosphates in water. The phosphate contents of the effluents may lead to significant undesirable growth of the planktons and other weed species leading to organic pollution of water body. Inorganic phosphorus is one of the most important nutrients limiting growth of autotroph and thus biological productivity of system. Industrial effluents, domestic sewage, detergents are main sources of phosphates in water.

In present study, the phosphate content was maximum of 5.00 mg / l in the month of March, 2009 while minimum of 2.25mg / l in the month of December, 2008 and October, 2009 at study station.

Nitrates are the highest oxidized form of nitrogen. It is contributed to surface water to a large extent, by sewage and industrial effluents and also due to biological fixation and oxidation of organic matter. The run-off water coming from intensive agricultural activity (involving the use of fertilizers) also significantly contribute to the higher nitrate content in water is an indication of pollution.

Concentration of nitrate beyond 45 mg / l causes methaemoglobinemia (Horne and Goldman, 1983). In the present study, the values of nitrates ranged between BDL to 17.50 mg / l. The values of nitrate concentration at study station were within the limit of ISI desirable standard (25 mg / l).

## CONCLUSION

The present study indicates that the various physico-chemical parameters of the river water were within the limits of ISI standard. The water is non-polluted and can be used for domestic, irrigation and pisciculture purpose.

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