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WATER QUALITY PARAMETERS IN SINDPHANA DAM NEAR SHIRUR KASAR, BEED DISTRICT, MAHARASHTRA STATE, INDIA

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Abstract: Water analysis is essential to preserve and protect the natural ecosystem, which depends on their physical, chemical and biological characteristics; these are directly linked with human welfare. This study was evaluated the physicochemical features of water and their relationships in Sindphana Dam near Shirur Kasar, Breed district, Maharashtra state, India between January and December 2012. This study shows the water quality parameters were fluctuated during the summer, monsoon and winter seasons in Sindphana Dam. In this study, air temperature was positively related to water temperature, transparency and pH while it was negatively related to electric conductivity and dissolved oxygen (DO). The water temperature was positively related to air temperature, transparency and pH, while it was negatively related to electric conductivity and DO. Water transparency also negatively related to turbidity, electric conductivity, biochemical oxygen demand (BOD) and chemical oxygen demand (COD). Electric conductivity was positively related to turbidity, BOD and COD. The pH was negatively related to electric conductivity, DO, BOD and COD. The study indicated that the Sindphana Dam water quality parameters were acceptable limits for aquatic biota.

Key words: water quality, seasonal variations, and Sindphana Dam

INTRODUCTION

Freshwater is one of the most precious and essential requirements for all living things on the earth. Water analysis knowledge is essential for knowing the physical, chemical, biological conditions and the composition of the biota potentialities of a dam. Surface water resources have played an essential role in the area's drinking water requirement, which may be fulfilled by the river, lake, ponds, canal, etc. Lakes are visual tools for managing freshwater resources, contributing to socio-economic development and drinking water supply; therefore the organic components are related to human activities such as mining, agriculture, stock-breeding, fisheries, urbanization activities,

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leather industries, forestry, and various other mills and factories. If any change in the physicochemical characteristics of dam water because of pollution which harmful for the dam. Water bodies sited in the town found various human activities such as clothes washing, bathing, and dying of clothes these activities affect the water quality of dam water. The quality of water depending on endues of the particular water body. For example, water suitable for agriculture may not be ideal for recreational purposes; water ideal for drinking may not be suitable for specific industrial uses such as chemical and pharmacy industries (Shinde *et al.*, 2011).

In tropical countries, there may be a direct relationship between the duration of sunshine and temperature. The present study has been indicating the water quality of Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India. To study the physicochemical characteristics of dam water which is essential for human use in that vicinity. The suitability of water for drinking and irrigation purposes about pollution. The concentration of physical and chemical substances in dam water which are dangerous to human health. The proper utilization of natural resources and sustainable economic development of the community directly or indirectly depend on dam water

MATERIAL AND METHODS

The water samples for physicochemical analysis were collected from Sindphana Dam geographical coordination of Longitude 18.9933914^0 N and Latitude 75.3895998^0 E near Shirur Kasar Dist. Beed [M.S] India, in the early morning between 8 am to 11 am in the first week of every month from January 2012 to December 2012. The samples were collected in the pre-acid-washed five-liter plastic container depth of 5-10 cms below the surface of the water. Separate samples were collected for Dissolve Oxygen in 250 ml bottles and dissolved oxygen was fixed in the field by adding alkaline iodide-azide solution immediately after collection. The samples were analyzed directly in the laboratory.

The water quality status of the lake water was determined seasonally viz summer, monsoon, and winter. Physicochemical characteristics like air temperature, water temperature, turbidity, transparency, pH, conductivity, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), and Biochemical Oxygen Demand (BOD) were determined seasonally in summer, monsoon, and winter according to standard methods (APHA, 1998; Trivedi and Goel, 1987).

RESULT AND DISCUSSION

The water parameters were studied and recorded in three seasons, summer, monsoon, and winter, respectively. The seasonal data of Sindphana water body

near Shirur Kasar Dist. Beed [M.S] India has been presented in the table. No.1 and 2.

Physicochemical Characteristic: These are measured the extreme significant values in recognizing the environmental quality, and type of freshwater, brackish water, and saline water in any aquatic ecosystem. Physicochemical characteristics were observed and recorded as follows.

Temperature: The air temperature was ranged from 20.3 to 35.9 ºC. The average air temperature was maximum 33.57±2.54 ºC in summer and minimum 21.87±1.29 ºC during winter with an average annual mean of 27.44±5.86 ºC (Table 1). The air temperature was positively correlated to water temperature, transparency, and pH while it was negatively correlated to electric conductivity, and DO (Table 2).The water temperature was ranged from 17.6 to 32.1 ºC. The average water temperature values were maximum in summer 29.67±1.97 ºC and minimum during winter 18.62±1.30 ºC with an average annual mean of 23.81±5.55 ºC (Table 1). In the water temperature was positively correlated to air temperature, transparency, and pH, while it was negatively correlated to electric conductivity, and DO (Table 2).

Transparency: The light can penetrate up to the extent which depends on the transparency of the vertical water column. It is expressed in centimeters. Water transparency depends upon turbidity. A wide variety of suspended materials may cause turbidity and transparency ranging from colloidal to coarse dispersion, making the water unfit for drinking (Shinde *et al.*, 2010). The permissible limit of turbidity is up to 5 NTU (WHO) and the Indian standard is 10 NTU.

The water transparency values were ranged from 8.2 to 25.4 cm. The average transparency values were maximum in summer at 21.20±3.82 cm and minimum during the monsoon at 10.02±2.76 cm and the average annual mean was 15.37±5.60 cm (Table 1). Transparency was positively correlated to air temperature, water temperature, and pH, while it was negatively correlated to turbidity, electric conductivity, BOD, and COD (Table 2). The water was less transparent during the monsoon as compared with winter and summer (Kadam *et al.*, 2007 and Jayabhaye *et al.*, 2008).

Turbidity: Turbidity is closely associated and directly proportional to light velocity fluctuations in all twelve months. It begins to rises in May and reaches its maximum in June, with a high percentage of total solids and poor transparency from May to June. In the case of transparency, low values were recorded in June and high values of transparency were recorded in December (Shinde *et al.*, 2011).The turbidity ranged from 8.9 to 12 NTU. Turbidity values were maximum during monsoon was recorded as 11.80±0.40 NTU and the

Table 1. Seasonal variations in Physicochemical parameters of Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India. (During January 2012 - December 2012)

Parameter	Range	Summer	Monsoon	Winter	Average
Air Temperature (ºC)	20.3-35.9	33.57±2.54	26.90±1.61	21.87±1.29	27.44±5.86
Water Temperature (ºC)	17.6-32.1	29.67±1.97	23.15±1.30	18.62±1.05	23.81±5.55
Transparency (cm)	8.2-25.4	21.20±3.82	10.02±2.76	14.90±3.31	15.37±5.60
Turbidity (NTU)	8.9-12	9.87±0.81	11.80±0.40	10.05±1.02	10.57±1.06
Conductivity (µmhos /cm)	205-540	239.75±33.76	492.50±50.57	400±43.96	377.41±127.87
pH	8-8.6	8.42±0.17	8.20±0.14	8.12±0.15	8.24±0.15
DO (mg/l)	3.5-5.3	3.85±0.23	4.30±0.18	5.07±0.17	4.40±0.61
BOD (mg/l)	3.2-8.1	4.05±0.58	7.76±0.46	5.87±0.52	5.89±1.85
COD (mg/l)	8.2-20.1	9.97±1.50	18.65±1.47	14.22±1.32	14.28±4.43

DO: Dissolve Oxygen, BOD: Biochemical Oxygen Demand, COD: Chemical Oxygen Demand. minimum during summer was 9.87±0.81 NTU with an average annual mean of 10.57±1.06 NTU (Table 1). Turbidity was positively correlated to electric conductivity, BOD, and COD while it was negatively correlated to transparency (Table 2).

Table 2: - Values of correlation coefficient among Physicochemical parameters, of Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India(During January 2012 - December 2012)

Parameters	Air. Temp.	Wat. Temp	Tran.	Turb.	Cond.	pH	DO	BOD	COD
Air Temp. (ºC)	1	0.99**	0.62*	-0.16	-0.68*	0.98**	-0.97**	-0.55	-0.55
Water Temp. (ºC)		1	0.64*	-0.18	-0.70*	0.98**	-0.96**	-0.57	-0.57
Transparency (cm)			1	-0.87**	-0.99**	0.75*	-0.43	-0.99**	-0.99**
Turbidity (NTU)				1	0.82**	-0.34	-0.06	0.90**	0.91**
Conductivity (µmhos /cm)					1	-0.80**	0.50	0.98**	0.98**
pH						1	-0.91**	-0.70*	-0.69*
DO (mg/l)							1	0.35	0.35
BOD (mg/l)								1	0.99**
COD (mg/l)									1

**significant at $p < 0.01$, *significant at $p < 0.05$

In the present study, the lowest values of turbidity and highest transparency in winter. The highest values of turbidity and lowest transparency in the monsoon. Minimum turbidity and maximum transparency during winter are due to the settlement of total solids as light penetration depends upon the number of suspended particles. Thus, it seems that transparency is inversely proportional

to turbidity (suspended matter). During the monsoon, the process of photosynthesis was mainly inhibited. Similar findings have been observed by Kumar *et. al.,* (2006).

Electric Conductivity: Because conductivity is a measure of total ions, it is a numerical indication of its ability to carry electric current. It is dependent on the ionic strength. The ionization of solutes and other compounds dissolved in a sample determines its ionic strength. The conductivity of water, therefore, gives an idea about the total dissolved solids in it (Shinde *et al.*, 2010).

Electric conductivity ranged from 205 to 540 µmhos/cm. Electric conductivity was maximum during the monsoon at 492.50±50.57 µmhos/cm and minimum during summer at 239.75±33.76 µmhos/cm and the average annual mean was 377.41±127.87 µmhos/cm (Table 1). Electric conductivity was positively correlated to turbidity, BOD, and COD, while it was negatively correlated to air temperature, water temperature, transparency, and pH (Table 2).The high value in monsoon could be due to the inflow of domestic sewage in the monsoon, and low values in summer due to higher temperatures. During the present investigation, the range observed was higher than the permissible limits given by ISI, so the dam water is not suitable for drinking purposes.

PH: The negative logarithm of hydrogen ion concentration is used to calculate PH values. The pH of acidic water ranges from 0 to 7, while the pH of alkaline water extends from 7 to 14. It determines the solubility of most compounds based on their chemical makeup. For biological production, medium levels are ideal (Shinde *et al.*, 2010).

The pH levels were between 8 and 8.6. The highest pH was 8.42±0.17 in the summer, while the lowest was 8.12±0.15 in the winter with the average annual mean was 8.24±0.15 (Table 1). The pH was positively correlated to air temperature, water temperature, and transparency, while it was negatively correlated to electric conductivity DO, BOD, and COD (Table 2). Similar results were reported by (Subbamma and Rama, 1992) from a minor pond near Machaliptanum. The pH levels varied from 7.2 to 8.7, suitable for the aquatic organism (Rajshekhar *et al.*, 2007).

In summer, high pH might be due to a reduced water level in the dam, and the low pH value was observed during the winter due to heavy water in the water body.

Dissolve Oxygen (DO): One of the most important and limiting water quality elements for aquatic life is dissolved oxygen (DO). It modulates aquatic organisms' metabolic activities. The amount of dissolved oxygen (DO) in natural and urban is determined by the water body's physical-chemical and biological

processes. DO testing is an important part of determining water pollution and wastwater treatment.

The concentrations of dissolved oxygen ranged from 3.5 to 5.3 mg/l. The DO readings were highest in the winter at 5.07±0.17 mg/l and lowest in the summer at 3.85±0.23 mg/l, with an average annual mean of 4.40±0.61 mg/l (Table 1). Dissolved oxygen was not positively correlated, negatively correlated to air temperature, water temperature, and pH (Table 2). It's possible that the high DO in the winter is due to the low atmospheric temperature and intensive photosynthetic activity (Shinde *et al.*, 2010). The minimum DO was recorded in the summer months due to the high metabolic rate of organisms (Hazal wood and Parker, 1961, Manawar, 1961 and Shinde *et al.*, 2011).

Biochemical Oxygen Demand (BOD): The amount of oxygen required by bacteria when stabilizing biologically decomposable organic matter in water under aerobic circumstances is known as biochemical oxygen demand (BOD) (Shinde *et al.*, 2011). BOD is an indicator of knowing the presence of biodegradable matter in the waste and expressing the degree of contamination. BOD test is a measure level of pollution degree in water that was first used in 1912 by "The Royal Commission on Sewage Disposal." Organic materials may demand oxygen in a water body and nitrogenous compounds, which may react with dissolved molecular oxygen and thus create oxygen tension in the dam. The biochemical oxygen demand (BOD) is a measurement of how much oxygen microorganisms need to break down organic materials in a water sample under specified conditions (Boyd, 1978).

BOD was ranged from 3.2 to 8.1 mg/l. The BOD values were maximum in monsoon of 7.76±0.46 mg/l and minimum in summer of 4.05±0.58 mg/l and the average annual mean of 5.89±1.85 mg/l (Table 1). The biochemical oxygen demand was positively correlated to turbidity, electric conductivity and COD, negatively correlated to transparency and pH (Table 2). In comparison to the summer and winter seasons, the BOD values were greater during the monsoon. This could be due to the presence of a variety of contaminants in the rainwater.

Chemical Oxygen Demand (COD): It is used for measuring the pollution level of wastwater, as most of the organic compounds can be oxidized to CO_2 and water by the action of potent oxidizing agents, regardless of biological substances. The low DO content of a water body indicates the presence of organic debris, which consumes oxygen for decomposition and depletes its concentration. Such processes, consuming oxygen for the degradation of organic matter, are either biological or chemical. In natural processes, bacteria catalyze the degradation of organic matter and in the chemical process, chemicals of oxidizing nature degrade the organic matter, which is respectively

BOD and COD tests. The COD test measures the oxygen requirement to remove chemically oxidizable organic matter present in the water (Shinde *et al.*, 2010).

COD ranged from 8.2 mg/l to 20.1 mg/l. The higher values were recorded in monsoon (18.65±1.47 mg/l) and lower in summer (9.97±1.50 mg/l) and the average annual mean of 14.28±4.43 mg/l (Table 1). The chemical oxygen demand was positively correlated to turbidity, electric conductivity and BOD while negatively correlated to transparency and pH (Table 2). The COD was high in the rainy season, while in the winter season, the COD value was minimum as the organic pollution was minimum.

CONCLUSIONS

The present study shows a detailed survey regarding water quality in Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India. The seasonal fluctuations in various physicochemical parameters. The range of observed parameters were below the acceptable limits set by ISI during the current investigation, indicating that the water from the mentioned dam is safe to drink. The present study shows that the significant positive and negative correlation present in physicochemical parameters. Conclude that all of the parameters are correlated with each other. Correlation coefficients are used to measure the strength of the association between parameters. The water from the dam can be used for irrigation and fish farming. Improve water quality; pollution levels should be monitored regularly to ensure optimal conditions for fish survival, growth, and reproduction. In Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India.

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