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### Water Status of Sindphana Dam Near Shirur Kasar, Dist. Beed (M.S), India

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**Abstract:** Water is one of the most amazing compounds in nature and consists of two common elements hydrogen and oxygen. Water plays an important role in environmental ecosystems. It acts as an universal solvent for many more compounds than any other liquid providing ionic balance and nutrients, which support life. The present study deals with the Physico-chemical properties, seasonal variation, correlation coefficient, and water quality assessment of Sindphana Dam near Shirur Kasar, Dist. Beed [M.S] India, analyzed from January - December 2012. The results indicated that the condition of the dam in different seasons showed fluctuations in Physico-chemical parameters; with the help of this understanding, the water quality of the dam and the correlation coefficient show a highly significant positive and negative relationship ( $p < 0.01$ ) and also a significant positive and negative relationship ( $p < 0.05$ ) when these parameters are correlated with the different seasons. Correlation coefficients are used to measure the strength of the association between parameters.

**Keywords:** Water status, Seasonal variations, Correlation coefficient, Water quality assessment, Sindphana Dam, Physico-chemical properties

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### Introduction

A study of water with different aspects is important. Although the percentage of utilization of water resources for purposes other than irrigation is low at present, this is expected to rise appreciably in the future with increasing industrialization and power generation. The conservation and efficient utilization of available water resources need maximum emphasis.

Therefore, there is a need to give serious consideration while making decisions relating to water management in the future. Although the new millennium has made an appearance with many environmental problems, degradation of land, air, and water, an increase of incidences of infectious diseases, and consequent poverty; the most acute problem, that human has to face in the

first decade of the millennium will be water resources. Water is going to become more costly and rare as per the opinions expressed by the experts and this needs the collection of data on water resources and their management (Sangewar, 2008).

The methods of controlling thermal pollution include cooling ponds, cooling towers, and dry cooling towers. Many times, the problem with water is contamination. The contamination comes from old lead piping and solder that have been used in plumbing for years. Some bottled water contains many of the same contaminants that tap water does. In many cases, the cheapest and most effective way to reduce pollution is to avoid production and its release into the environment in the first place (Enger and Bradely, 1995).

Pollution is an undesired change in the environment. Water pollution, and other types of pollution are reaching alarming levels due to human negligence. Point source pollution is easy to identify and resolve. Nonpoint sources of pollution such as agricultural runoff and mine drainage are more difficult to detect and control than those from municipalities and industries. Thermal pollution occurs when the industry returns heated water to its source. Temperature changes in water can alter the number of plants and animals that live in that area (Shinde, 2011).

The present work was undertaken with the aim to evaluate the different hydrobiological parameters, which influence water quality. The monthly sampling was carried out for one year. Investigation was undertaken to evaluate the water quality of Sindphana Dam, as it is an important water body for the people of the area and most of the needs of domestic nature are met by the dam. The study aimed to quantify the amounts of various parameters and to have the Physico-chemical picture of the dam water.

## Materials and Methods

The water samples for Physico-chemical analysis were collected from Sindphana Dam [geographical coordination Longitude 18.9933914° N and

Latitude. 75.3895998° E near Shirur Kasar Dist. Beed (M.S) India], in the early morning between 8 am and 11 am in the first week of every month from January 2012 to December 2012. The samples were collected in the acid-washed five-liter plastic container at depth of 5-10 cm below the surface of the water. The samples were analyzed directly and returned to the laboratory. Physico-chemical characteristics are determined seasonally in summer, monsoon, and winter according to standard methods (Trivedi and Goel, 1987; APHA, 2005).

Studies on the Physico-chemical analysis of water are undertaken to collect data regarding water quality, the influence of human activity on water quality, and for establishing the criteria for present and planned uses. The study, in general, is undertaken in three steps; a periodic collection of surface samples at fixed stations, analyses of collected samples by the standard methods, and finally evaluation of data obtained.

## Results and Discussion

The water parameters were studied and recorded during three seasons, summer, monsoon, and winter. The seasonal variation of Physico-chemical parameters and correlation coefficient data of Sindphana Dam near Shirur Kasar, Dist. Beed [M.S] India has been presented in the Tables 1 and 2. Physico-chemical characteristics are considered the most important parameters in identifying the nature, quality, and type of freshwater, brackish water, and saline water in any aquatic ecosystem. Physico-chemical characteristics were observed and recorded as follows:

The total solids values ranged from 400 to 470 mg/l. The average total solids values were maximum in monsoon  $453.5 \pm 18.15$  mg/l and minimum during summer  $411.25 \pm 11.08$  mg/l and average annual mean was  $415 \pm 0.44$  (Table 1). The Total Dissolved Solids values ranged from 295 to 435 mg/l. The average Total Dissolved Solids values were maximum in monsoon  $427.5 \pm 6.45$  mg/l and minimum during summer  $303.5 \pm 7.23$  mg/l and average annual mean was  $415 \pm 0.44$

Table 1: Seasonal variations in physico-chemical parameters of Sindphana dam during January to December 2012

Parameter	Range	Summer	Monsoon	Winter	Average
<b>Total Solids (mg/l)</b>	400-470	411.25±11.08	453.5±18.15	430±25.49	441.75±7.20
<b>Total Dissolved Solids (mg/l)</b>	295-435	303.5±7.23	427.5±6.45	402.5±6.45	415±0.44
<b>Total Suspended Solids (mg/l)</b>	7-12	7.75±0.64	10.62±1.37	8.25±0.64	9.43±0.42
<b>Alkalinity (mg/l)</b>	155-225	207.5±13.22	178.5±8.10	160±4.08	169.25±4.58
<b>Total hardness (mg/l)</b>	335-500	342.5±6.45	482.5±17.07	415±12.90	448.75±5.32
<b>Chloride (mg/l)</b>	20-34	32.75±0.95	26.75±2.21	20.87±0.85	26.79±0.75
<b>Nitrate (mg/l)</b>	0.4-2	0.5±0.1	1.35±0.72	1.05±0.31	1.2±0.31
<b>Sulphate (mg/l)</b>	9-18	17.25±0.64	15.875±0.85	11.5±2.64	13.68±1.09
<b>Phosphate (mg/l)</b>	0.1-0.9	0.18±0.08	0.8±0.08	0.61±0.08	0.70±0.00

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

Parameters	T.S	T.D.S	T.S.S	Alkalinity	T.H	Chloride	Nitrate	Sulphate	Phosphate
Total Solids	1	<b>0.92**</b>	<b>0.95**</b>	-0.55	<b>0.99**</b>	-0.44	<b>0.97**</b>	-0.16	<b>0.95**</b>
Total Dissolved Solids		1	<b>0.77*</b>	<b>-0.83**</b>	<b>0.95**</b>	<b>-0.75*</b>	<b>0.98**</b>	-0.53	<b>0.99**</b>
Total Suspended Solids			1	-0.28	<b>0.92**</b>	-0.16	<b>0.86**</b>	0.12	<b>0.83**</b>
Alkalinity				1	<b>-0.62*</b>	<b>0.99**</b>	<b>-0.73*</b>	<b>0.91**</b>	<b>-0.76*</b>
Total hardness					1	-0.52	<b>0.98**</b>	-0.24	<b>0.98**</b>
Chloride						1	<b>-0.64*</b>	<b>0.95**</b>	<b>-0.68*</b>
Nitrate							1	-0.38	<b>0.99**</b>
Sulphate								1	-0.43
Phosphate									1

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

mg/l (Table 1). The Total Suspended Solids ranged from 7 to 12 mg/l. Total Suspended Solids values were maximum during monsoon ( $10.62 \pm 1.37$  mg/l) and the minimum during summer ( $7.75 \pm 0.64$  mg/l) and the average annual mean was  $9.43 \pm 0.42$  mg/l (Table 1). The Alkalinity ranged from 155 to 225 mg/l. Alkalinity was maximum during summer ( $207.5 \pm 13.22$  mg/l) and minimum during winter ( $160 \pm 4.08$  mg/l) and the average annual mean was  $169.25 \pm 4.58$  mg/l (Table 1). The total hardness values ranged from 335 to 500 mg/l. The maximum total hardness was recorded in monsoon ( $482.5 \pm 17.07$  mg/l) and the minimum was in summer ( $342.5 \pm 6.45$  mg/l) and the average annual mean was  $448.75 \pm 5.32$  mg/l (Table 1). The Chloride values ranged from 20 to 34 mg/l. The Chloride values were maximum in summer ( $32.75 \pm 0.95$  mg/l) and minimum during winter ( $20.87 \pm 0.85$  mg/l) and the average annual mean recorded as  $26.79 \pm 0.75$  mg/l (Table 1). Nitrate ranged from 0.4 to 2 mg/l. The Nitrate values were maximum in monsoon ( $1.35 \pm 0.72$  mg/l) and minimum in summer ( $0.5 \pm 0.1$  mg/l) and the average annual mean recorded as  $1.2 \pm 0.31$  mg/l (Table 1). Sulphate ranged from 9 to 18 mg/l. The higher values were recorded in summer ( $17.25 \pm 0.64$  mg/l) and lower in winter ( $11.5 \pm 2.64$  mg/l) and the average annual mean was  $13.68 \pm 1.09$  mg/l (Table 1). Phosphate ranged from 0.1 to 0.9 mg/l. The higher values were recorded in monsoon ( $0.8 \pm 0.08$  mg/l) and lower in summer ( $0.18 \pm 0.08$  mg/l) and the average annual mean was  $0.70 \pm 0.00$  mg/l (Table 1).

The total solids were positively correlated to TDS, TSS, TH, Nitrate, and phosphate. Total Dissolved Solids were positively correlated to TS, TSS, TH, nitrate, and phosphate, while it was negatively correlated to alkalinity and chloride. Total Suspended Solids were positively correlated to TSS, TDS, TH, nitrate, and phosphate. Alkalinity was positively correlated to chloride and sulphate, while it was negatively correlated to TDS, TH, nitrate, and phosphate. The total hardness was positively correlated to TS, TDS, TSS, nitrate, and phosphate, while it was negatively correlated to

alkalinity. Chloride was positively correlated to alkalinity and sulphate was negatively correlated to TDS, nitrate, and phosphate. The Nitrate was positively correlated to TS, TDS, TSS, TH, and phosphate, and negatively correlated to alkalinity and chloride. The Sulphate was positively correlated to alkalinity and chloride. The Phosphate was positively correlated to TS, TDS, TSS, TH, and nitrate while negatively correlated to alkalinity and chloride (Table 2).

In the present study, the values of TS, TDS, and TSS were highest during the monsoon and lowest in summer. High levels of total suspended solids during the monsoon can be due to siltation, weathering, heavy rainfall, and rainwater mixing with mud, sand, etc. mixed with dam water. In the present study, alkalinity was highest in summer and lowest during monsoons. This can increase the rate of organic decomposition, releasing  $\text{CO}_2$  and reacting with water to form  $\text{HCO}_3^-$ , increasing total alkalinity in summer. The increased alkalinity in summer and winter is due to the concentration of nutrients in the water. The decrease in alkalinity was due to dilution by rainwater during the monsoon. In the present study, the highest hardness was measured during the monsoon season, and the lowest during the summer season. Hardness is mainly due to calcium and magnesium, the main cations present in natural waters. Their main source is the leaching of rocks in watersheds. The maximum total hardness measured during the monsoon could be the leaching of rock from the watershed. In the present study, sulfate was highest during the monsoon and lowest in winter. The maximum sulfate concentration during the monsoon can be due to the dilution and utilization of sulfate by aquatic plants. However, the low sulfate concentration found during the winter could be due to biodegradation and low water levels. In the present study, the chloride level was highest in summer and lowest in winter. The maximum chloride was recorded in the summer and the minimum in the winter. It can be concluded that there was no clear pattern of chlorine fluctuation,

lower values in winter could be attributed to the dilution and renewal effect of the water mass after summer stagnation and could also be due to a high sedimentation rate under relatively stable environmental conditions. The maximum value in summer could be due to a higher concentration of chlorides caused by evaporation. In the present study, the nitrate content was highest during the monsoon and lowest during the summer season. Nitrate levels in surface waters often show marked seasonal variations, with concentrations being higher during the monsoon months than in the summer and winter months. During the summer months, nitrate reduction could be due to algae assimilation and other biochemical mechanisms, and elevated nitrate levels during the monsoon could be due to surface and domestic runoff, and in particular washing activities. In the present study, phosphate levels were highest during monsoons and lowest in summer. The maximum during the monsoon could be due to washing activities, there is an influx of detergents into the water body and a lower volume of water, and relatively low phosphate levels have been reported during the summer season attributed to the abundance of phytoplankton. Similar, results have been reported by Mohan (1980); Jain *et al.* (1996); Paka and Rao (1997); Prashad (1997); Bhalerao and Khan (2000); Yeole and Patil (2005); Solanki (2006); Karadkhele *et al.* (2008); Pawar and Pulle (2005); Chavan *et al.* (2005); Ingole *et al.* (2009); Shinde *et al.* (2010, 2011); Raut *et al.* (2011) and Rathod and Shinde (2011).

## Conclusion

The present study showed a detailed survey regarding water quality in Sindphana Dam near Shirur Kasar Dist. Beed (M.S), India. The summer, monsoon, and winter seasons showed different seasonal fluctuations in various Physico-chemical parameters. During the present investigation, the range of observed parameters was below the permissible limits given by ISI, indicating that the water of the said dam is suitable for drinking purposes. The present study performs the significant positive and negative correlation

present in Physico-Chemical parameters. We can conclude that all the parameters are more or less correlated with each other. Correlation coefficients are used to measure the strength of the association between parameters. The water of the present Dam is helpful for irrigation as well as fish culture. Improve water quality and continuous monitoring of pollution levels should be done to maintain the favorable conditions of fish survival growth and reproduction in Sindphana Dam near Shirur Kasar Dist. Beed (M.S), India.

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