

ORIGINAL ARTICLE



**ASSESSMENT OF SEASONAL WATER QUALITY OF SHAHANOOR DAM ,  
ANJANGAON SURJI, DIST. AMRAVATI, MAHARASHTRA, INDIA.**

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**ABSTRACT**

Shahanoor Dam, is an earth fill dam on Shahanoor river near Anjangaon Surji, Amravati district in the state of Maharashtra. The present study was carried out to determine the seasonal water quality of Shahanoor dam in order to study the factors affecting water quality and to check the suitability of water for drinking and also to document the record of water quality data pertaining to the physico-chemical parameters such as pH, TDS (Total Dissolved Solids), DO (Dissolved Oxygen), Alkalinity, Total Hardness, Chloride, Sulphate and COD (Chemical Oxygen Demand). The water quality parameters considered for monthly fortnightly and seasonal analysis and were compared with the water standards laid down by the WHO and ICMR for drinking purpose. The observations made on the water quality parameters suggests that dam water is affected by the pH, DO, Chloride, COD and Sulphate up to lesser extent but TDS, Alkalinity, Total hardness are the prevailing factors affecting the water quality of dam up to greater extent. On comparing seasonal observations only winter season water quality is seems to be suitable for drinking purpose except the parameters TDS and Total hardness which are of major concern. Water quality is more deteriorates in summer followed by rainy season.

**KEYWORDS:** *water quality, physico-chemical parameters, water standards, Shahanoor dam Maharashtra.*

**1. INTRODUCTION**

Water is considered as an essential ecological factor of life which affects and performs exceptional and indispensable activities in each ecosystem, biosphere and biogeochemical cycle (Trivedi et.al 2010). Water plays an important role in different crucial activities of all living organisms and has socio-economic impacts leading to human health (Kesre, 2011). The deterioration aquatic ecosystems due to the continuous release of different types of wastes.

Dams and reservoirs were considered as the main inland fishery resources in India considering its potential area of fish production and also as the consistent and sustainable

resources for drinking water and irrigation. Therefore it is very necessary to examine the changes in some physical and chemical factors of water quality monthly, seasonal, vertical and diurnal for recognition and predictions of fluctuations and the hazardous effects of these physico-chemical factors on flora and fauna leading to the scientific monitoring of physical, chemical and biological components of water so that proper judgment or idea can be generate on water pollution.

Many studies have been made by the researchers on physico-chemical parameters of various freshwater bodies like dams, reservoirs (Wagh, 1998, Sakhare & Joshi, 2002; Pawar & Pulle, 2005; Kadam,et.al 2007; Kamble & Kamble, 2009; Dhembare,2012; Nagargoje & Bhosle , 2012; Yannawar et al.2013; Patil,2014; Most of the studies revealed serious pollution problems due to the major fluctuations cause by anthropogenic activities, geology of the area, environmental and climatic conditions in the values of physico-chemical factors leading to the poor water quality of that area making water unsuitable for potability.

The present study was carried out to determine the seasonal water quality of Shahanoor dam in order to study the factors affecting water quality and to check the suitability of water for drinking and also to document the record of water quality data pertaining to the physico-chemical parameters such as pH, TDS (Total Dissolved Solids), DO (Dissolved Oxygen), Alkalinity, Total Hardness, Chloride, Sulphate and COD (Chemical Oxygen Demand).

## **2. MATERIAL AND METHODS**

### ***2.1 Sampling site***

Shahanoor Dam, is an earth fill dam on Shahanoor river near Anjangaon Surji, Amravati district in the state of Maharashtra between the coordinates 21.2580714°N to 77.3229682°E and is built in the year 1990 by Govt. of Maharashtra, India. It mainly impounds the water of Shahanoor river with height 57.81 m (189.7 ft.) , length of about 828 m (2717 ft) and volume 3,446 km<sup>3</sup> (827 cubic meters). It covers total surface area 2970 km<sup>2</sup> (1150 square meter) with total capacity of water reservoir 46,040 km<sup>3</sup> (11,050 cubic meter). The dam water is mainly used for irrigation and water supply for various domestic purposes (<https://en.wikipedia.org>).

### ***2.2 Collection of Water Samples and Analysis***

Water samples for physico-chemical analysis were collected fortnightly during a month in previously cleaned polythene bottles. Water samples collected monthly between January 2012 and December 2012 from sampling site and analyzed on site and in laboratory as per the guidelines and standard methods prescribed by American Public Health Association (APHA 2005). The obtained monthly and seasonal analyzed values of physico-chemical parameters were compared with the ICMR (Indian Council of Medical Research) and WHO (World Health Organization) water standards for drinking water.

### ***2.3 Statistical analysis***

The data obtained in triplicate were analyzed by SPSS statistical package (Window version 17) and Microsoft software Excel 2007 and represented as mean values with standard deviation in figures and tables.

### 3. RESULTS AND DISCUSSION

The fortnightly and seasonal mean values of water quality parameters are depicted in table 1 and 2 respectively.

**Table 1: Fortnightly water analysis of Shahanoor Dam during**

WQP	Feb	Mar	Apr	May	June	July
pH	6.8 ±0.21	6.4 ±0.43	6.1 ±0.28	6.0 ±0.31	6.1 ±0.11	6.6 ±0.26
TDS	610 ±15.6	648 ±18.7	716 ±20.1	720 ±18.9	444 ±16.6	410 ±14.6
DO	2.9 ±0.12	2.6 ±0.09	2.2 ±0.11	2 ±0.08	3.6 ±0.14	3.9 ±0.10
Alkalinity	225 ±13.2	216 ±10.4	301 ±15.3	211 ±10.8	123 ±11.2	143 ±14.8
Total Hardness	510 ±18.1	480 ±15.2	490 ±17.4	605 ±21.1	611 ±16.8	608 ±17.6
Chloride	245.22 ±4.6	250.61 ±4.9	246.01 ±5.3	238.12 ±6.1	251.45 ±4.4	248.33 ±5.2
Sulphate	244 ±3.8	257 ±3.4	260 ±5.2	250 ±4.3	184 ±3.6	165 ±3.2
COD	20 ±1.04	22 ±1.08	24 ±1.01	23 ±1.05	20 ±1.07	19.5 ±1.03

\*All values are in mg/l except pH, ±SD n=3, Contd.  
 WQP= Water Quality Parameters, TDS= Total Dissolved Solids, DO= Dissolved Oxygen, COD=Chemical Oxygen Demand

Aug	Sept	Oct	Nov	Dec	Jan	Water Std.
6.7 ±0.36	6.8 ±0.51	7.4 ±0.55	7.6 ±0.41	7.1 ±0.51	6.5 ±0.38	7-8.5(ICMR)
432 ±17.5	403 ±14.3	553 ±12.3	590 ±14.1	605 ±18.9	580 ±13.8	500 (WHO)
3.6 ±0.08	3.8 ±0.15	3.6 ±0.11	4.4 ±0.16	4.6 ±0.13	4.0 ±0.10	5.00 (ICMR)
120 ±10.5	124 ± 9.8	100 ±12.6	109 ±14.7	117 ±11.9	153 ±12.9	120 (ICMR)
580 ±13.8	536 ±18.1	452 ±13.9	441 ±16.4	455 ±12.9	521 ±17.2	300 (ICMR)
230.65 ±5.6	223.74 ±5.2	198.23±5.5	187.15±4.8	192.55±3.9	212.14±4.8	250 (ICMR)
142 ±3.9	139 ±4.5	164 ± 4.1	208 ±4.8	188 ±5.3	213 ±3.7	250 (WHO)
18.5 ±1.06	18.5 ±1.04	17.5 ±1.09	18 ±1.07	19.5 ±1.01	19 ±1.06	20 (ICMR)

**Table 2: Seasonal mean variation in water quality parameters**

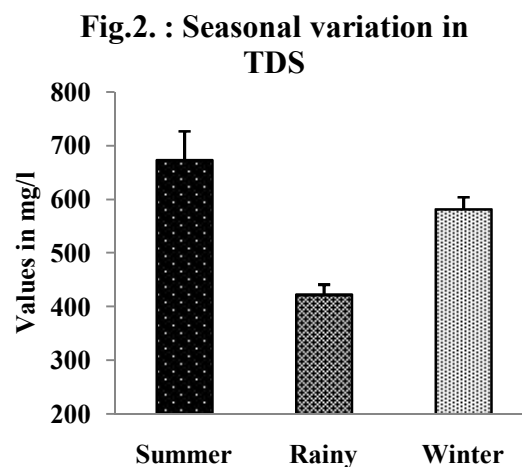
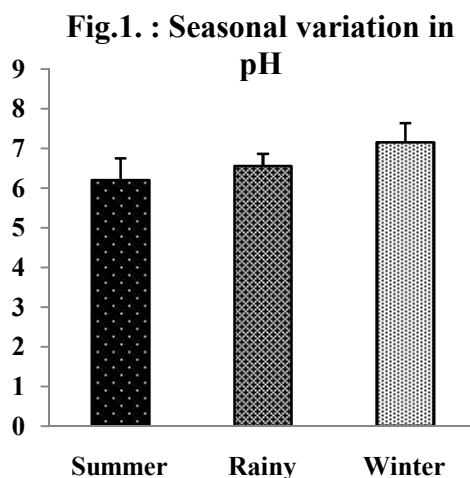
WQP	Summer	Rainy	Winter	Water Std.
pH	6.2 ±0.55	6.55 ±0.31	7.15 ±0.48	7-8.5(ICMR)
TDS	673.5 ±53.7	422.25 ±19.05	582 ±21.89	500 (WHO)
DO	2.42 ±0.40	3.72 ± 0.15	4.15 ±0.44	5.00 (ICMR)
Alkalinity	238.25 ±42.23	127.5 ±10.47	119.75 ±23.23	120 (ICMR)
Total Hardness	521.25 ±57.21	583.75 ± 34.76	467.25 ±36.34	300 (ICMR)
Chloride	244.99 ±5.16	238.54 ±13.46	197.51 ±10.75	250 (ICMR)

<b>Sulphate</b>	252.75 ±7.18	157.5 ± 21.14	193.25 ± 22.29	<b>250 (WHO)</b>
<b>COD</b>	22.25 ±1.71	19.12 ±0.75	18.5 ±0.91	<b>20 (ICMR)</b>

\*All values are in mg/l except pH, ±SD n=4,  
 WQP= Water Quality Parameters, TDS= Total Dissolved Solids, DO= Dissolved Oxygen,  
 COD=Chemical Oxygen Demand

### 3.1 pH

pH is one of the most important parameter that shows acid-base neutralization and water softening. The fortnightly mean value of pH ranges from 6.00 to 7.6 in the month of May and November respectively. Seasonal mean values of pH vary during different seasons and shows combination of both acidic and alkaline nature of water. However it remains under the prescribed limit value 7.0 – 8.5 of ICMR for drinking water (Table 1, 2 & Fig.1).



### 3.2 Total Dissolved Solids (TDS)

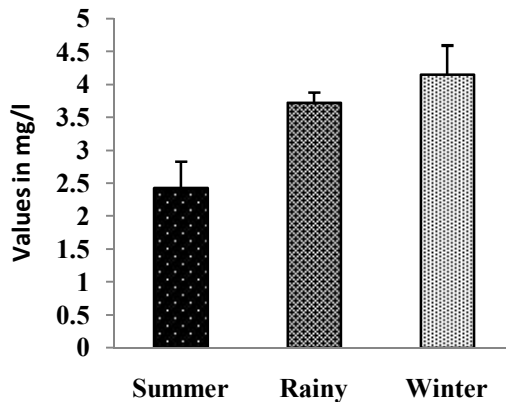
TDS is a direct measure of organic and inorganic substances dissolved in waters. The term total dissolved solids refer mainly to the inorganic substances that are dissolved in water. The effects of TDS on drinking water quality depend on the several factors like excessive hardness, taste; mineral depositions and corrosion are common properties of highly mineralized water. The fortnightly mean value of TDS ranges from 403 mg/l to 720 mg/l in the month of September and May respectively. Seasonal mean values of TDS were reported higher during summer followed by winter and less in rainy season which is under the prescribed limit value 500 mg/l of WHO for drinking water (Table 1, 2 & Fig.2).

### 3.3 Dissolved Oxygen (DO)

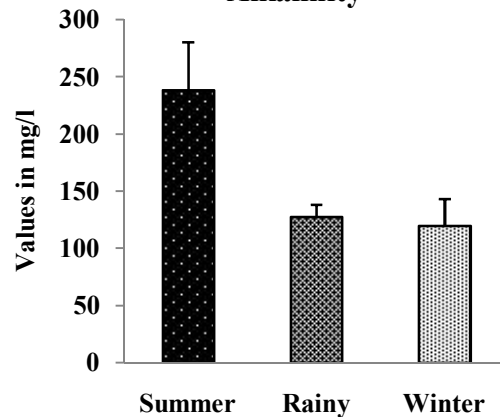
It is one of the basic parameters in water, important for the metabolic activities of all aerobic aquatic organisms. Photosynthesizing plants, stream flow aeration continuously added dissolved oxygen to water which is consumed from the water body by bacterial, plant and animal respiration, decaying plants and organisms and chemical oxidation (Moore 1973).The

fortnightly mean value of DO ranges from 2 mg/l to 4.6 mg/l in the month of May and December respectively. Seasonal mean values of DO were increased from summer followed by rainy and higher in winter season. However seasonal reported values for DO were not in accordance with the prescribed limit value 5.0 mg/l of ICMR but value of winter season reveals an approximate resemblance with it (Table 1, 2 & Fig.3).

**Fig.3. : Seasonal variation in DO**



**Fig.4. : Seasonal variation in Alkalinity**

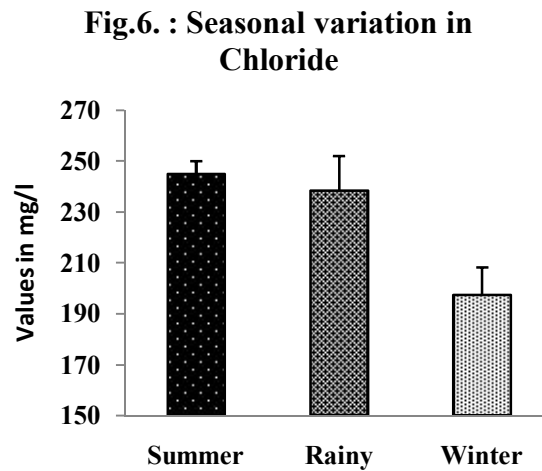
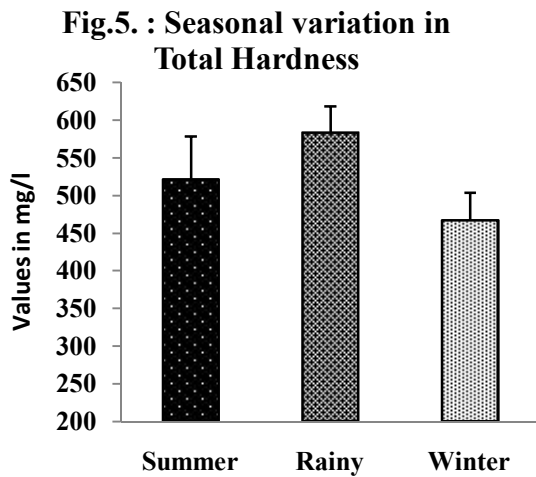


### 3.4 Alkalinity

Alkalinity of water is a measure of its capacity to neutralize acids and provides an index for the nature of salts present in the water samples. It is an aggregate measure of the sum of all titrable bases in the sample. Alkalinity in most natural waters is due to the presence of carbonate ( $\text{CO}_3^-$ ), bicarbonate ( $\text{HCO}_3^-$ ), and hydroxyl ( $\text{OH}^-$ ) anions. However, borates, phosphates, silicates, and other bases also contribute to alkalinity if present. The fortnightly mean value of Alkalinity ranges from 100 mg/l to 301 mg/l in the month of October and April respectively. Seasonal mean values of DO were increased from winter followed by rainy and higher in summer season. The lower Alkalinity value during winter season suggest its suitability for drinking water as the desirable range of ICMR is 120 mg/l (Table 1, 2 & Fig.4)

### 3.5 Total Hardness

Hardness is most commonly associated with the ability of water to precipitate soap. Chemically, hardness is often defined as the sum of polyvalent cation concentrations dissolved in the water. The most common polyvalent cations in fresh water are calcium ( $\text{Ca}^{++}$ ) and magnesium ( $\text{Mg}^{++}$ ). The fortnightly mean value of Total hardness ranges from 441 mg/l to 611 mg/l in the month of November and June respectively. A seasonal mean value of Total hardness exceeds the desirable range 300 mg/l of ICMR during all seasons indicating unsuitability for drinking purpose (Table 1, 2 & Fig.5).



### 3.6 Chloride

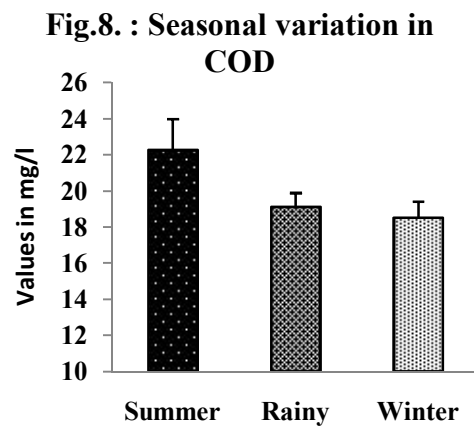
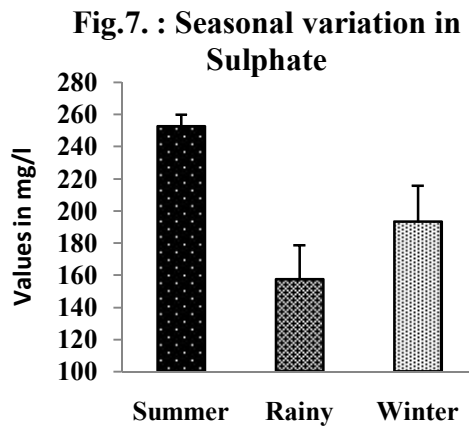
Naturally, chlorides occur in all type of waters, chloride in the groundwater contributed by the minerals like, mica, apatite, and hornblende (Das and Malik1998).The fortnightly mean value of Chloride ranges from 187.15 mg/l to 251.45 mg/l in the month of November and June respectively. A seasonal mean value of Chloride do not exceeds the desirable range 250 mg/l of ICMR during all seasons and remains within the limits indicating suitability of water for drinking purpose (Table 1, 2 & Fig.6).

### 3.7 Sulphate

Sulphate is utilized by all living organisms in the form of both mineral and organic sulphates. The fortnightly mean value of Sulphate ranges from 139 mg/l to 251.45 mg/l in the month of September and April respectively. A seasonal mean value of Sulphate remains in the desirable range 250 mg/l of WHO during rainy and winter season. However summer season value exceeds slightly indicating unsuitability for drinking purpose during the season (Table 1, 2 & Fig.7).

### 3.8 Chemical Oxygen Demand (COD)

COD is a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant (WHO, 1984). COD is a widely used index of waste water quality which relates to the oxygen required for complete oxidation of samples. The fortnightly mean value of COD ranges from 17.5 mg/l to 24 mg/l in the month of October and April respectively. A seasonal mean value of COD remains in the desirable range 20 mg/l of ICMR during rainy and winter season whereas it exceeds in summer season (Table 1, 2 & Fig.8).



In present study results on various water quality parameters reveals fluctuations in monthly and seasonal assessment of water quality of dam. The monthly observed values of pH, DO, TDS, Alkalinity, Total Hardness, Chloride, while assessing the water quality of Ujjani dam Solapur Maharashtra, Patil (2014) on Borgaon reservoir Sangli District Maharashtra, on Neelona dam Yavatmal, Maharashtra. Also the seasonal water quality parameters were reported with approximately similar values by Dhembre (2012) while assessing water quality indices of Dnyaneshwar dam Ahmadnagar, Maharashtra and Yannawar et al.(2013) while studying the water quality of Nagzari dam, Kinwat, Nanded District Maharashtra. However some of the water quality parameters like Chloride, Sulphate, Alkalinity shows different concentration levels which might be due to the anthropogenic activities (Singh, 1992), geology and hydrological activities (Tiway et al. 1995; Tiway and Dhar 1994).

#### 4. CONCLUSION

Present study was carried out in order to study the water quality of Shahanoor dam. The water quality parameters considered for monthly fortnightly and seasonal analysis and were compared with the water standards laid down by the WHO and ICMR for drinking purpose. The observations made on the water quality parameters suggests that dam water is affected by the pH, DO, Chloride, COD and Sulphate up to lesser extent but TDS, Alkalinity, Total hardness are the prevailing factors affecting the water quality of dam up to greater extent. On comparing seasonal observations only winter season water quality is seems to be suitable for drinking purpose except the parameters TDS and Total hardness which are of major concern. Water quality is more deteriorates in summer followed by rainy season. There is need to treat water before supply for drinking purpose.

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