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Assessment of physical parameters of Dedargaon Dam, Dist- Dhule, Maharashtra, India

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ABSTRACT

The present study is carried out during the study period Jan 2014 to Dec 2015. It deals with the assessment of water quality in terms of physical parameters. The water samples were collected from three sites of Dedargaon dam which supplies water to Dhule city of Maharashtra state, India. Certain physical parameters like colour, odour, temperature, pH, turbidity, total dissolved solids (TDS), etc. were assessed. The results were compared with the standards prescribed by National and International agencies like World Health Organization (WHO), International Standard Institute (ISI) and Bureau of Indian Standards (BIS). The results reveal that the values of physical parameters tasted were found to be in the prescribed permissible limit. Thus, the water is suitable for human use.

Key words:- Dedargaon dam, WHO, ISI, BSI, Water quality, Physico-chemical parameters.

INTRODUCTION

"Water is a liquid of life", as there can be no life possible without water. Water is the key compound and indispensable for life. The superiority of water requires for all living organisms which includes plants and animals. Man consumes water for various purposes like cooking, drinking, washing, etc. Every aquatic body is able to absorb some amount of contamination without any serious impact attributable to dilution and self purification factors. The water resources are supportive or potentially helpful for human being (Patil *et al*., 2012).

Water is God's creation and Pollution is man's contribution

Pollution makes changes in physical, chemical, radiological and biological factors of the resources. It happens due to various activities of human beings. As a result of these various anthropogenic performances, the water quite often becomes in poor condition for various uses like domestic, drinking purposes, industrial, irrigation purposes etc. the water bodies are also polluted by the release of sewage or industrial wastes. Mostly pollution begins from the removal of wastewater following the use of water for a wide variety of purposes. India is still rendering polluted water day by day and the circumstances are declining gradually due to careless performance of its

society (Sivalingam, 2018). The increased use of metal-based fertilizer in agricultural revolution of the government could result in continued rise in concentration of metal pollutions in fresh water reservoir due to the water run-off. Also faucal pollution of drinking water causes water born disease which has led to the death of millions of people. (Adefemi and Awokunmi, 2010).

Description of study Area:

India is a vast country; it measures the area of about 806 million acres. The area which was undertaken for investigation is rural districts of Maharashtra (India). The Dhule district is also known as West Khandesh and categorized as district head quarters since 1960. Dhule district was Situated between 73°47' and 75°11' East of longitude and 20°38' and 22°3' North latitude, is the westernmost of the districts of Northern border area of Maharashtra State.

Dedargaon Storage Dam

The Dedorgaon dam was situated on Anwar nala which was joined by River of Panzara. The construction of the dam was completed in 1885. The basement of dam water storage capacity elevation extended on 350 meters. The live water srorage capacity of the dam is 152.37. The overflow (maximum) water storage capacity of the dam is 346.70 meters. As well as the minimum water storage capacity of the dam is 338.10 meters. But intake capacity is 342.30 meters. The Dedorgaon dam is comparatively small reservoir; it supplies water to dhule city. It covers 18 % of city area and it is 15 km away from the city. From this source, water supplied at the rate of 5 MLD. The capacity of Dedargaon water works after increasing the capacity of Dedargaon tank. The pure water is stored at Malegaon GSR and from this storage tank the water is supplied to various regions i.e. Malegaon Naka, Mohadi, Mahada wasti, Dedargaon.

MATERIAL AND METHODS

For the collection of water samples three sites were selected from the dam site. Monthly collection of samples was taken in morning time. The water samples were collected in sterilized glass bottle with screw cap. After the collection, the samples were labelled as per date of collection, site number, timing of collection etc. Temperature was recorded immediately on site after collection of samples.

After collection, the sample were immediately transferred to laboratory for analysis of EC Turbidity, TDS etc. These parameters were measured in laboratory by different methods are shown in table-1A. The analytical methods were followed are described by NEERI (1981), Trivedi and Goel (1986) and Kodarkar (2006).

RESULTS & DISCUSSION

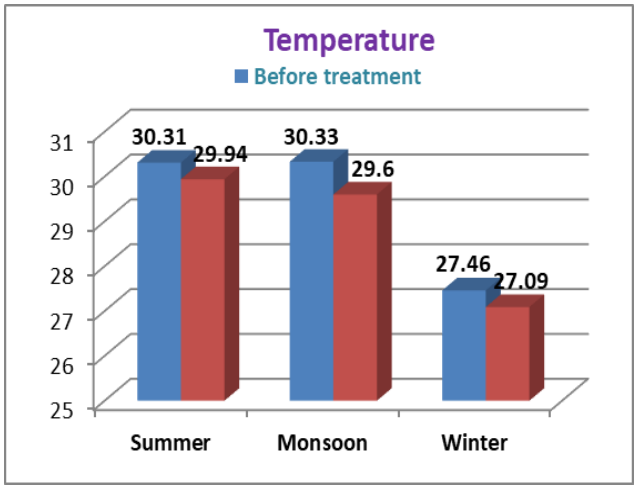
The statistical analysis of variation in physical parameters during study period i.e. Jan 2014-Dec 15 is presented in table-1; likewise seasonal variation also shown in graphs. From table and graphs, it is observed that the fluctuation of all these parameters was due to seasonal and environmental changes.

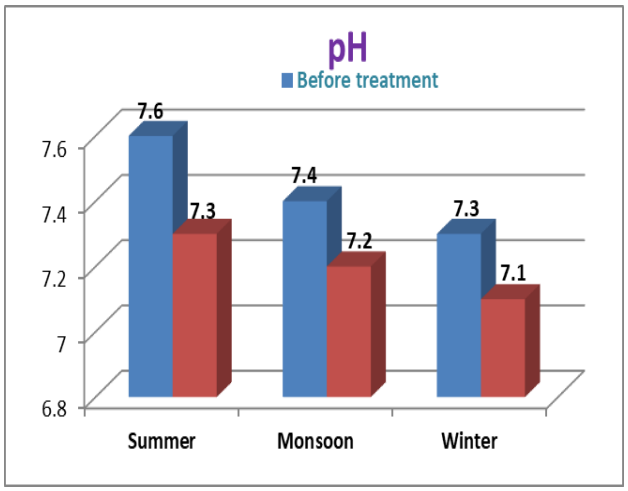
Plate-1: Dedargaon dam

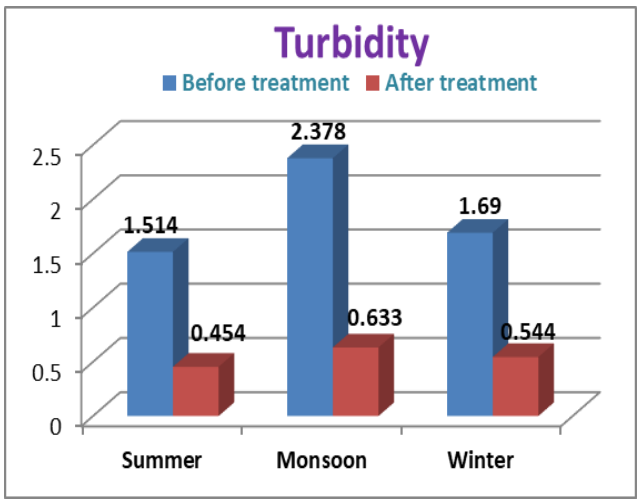
Colour:
The pure water has no colour. Throughout the study period the before treatment colour of water body i.e Dedargaon dam seen greenish in the winter season, in summer it appear a yellowish colour and in the monsoon season it has muddy to brownish colour. Whereas the after treatment water is colourless during the study period.

Odour:
In the present study the Dedargaon dam before treatment water has odour free in the winter season. In the summer season the odour of the water body has fishy and obnoxious smell while in the monsoon it gives muddy and soapy smell. The after treatment water which Supplied by municipal corporation is odourless and somewhat chlorinous smell throughout the study period.

Temperature:
The before and after treatment values of water temperature was recorded in summer i.e. (30.31 ± 0.89 ºC) and (29.94 ± 0.84 ºC) respectively. It was slightly decreased in monsoon (30.33 ± 0.53 ºC) and (29.6 ± 0.45 ºC) whereas during winter season, it was (27.46 ± 0.81 ºC) and (27.09 ± 0.76 ºC) with significant seasonal variations ($P< 0.05$, $F_{2\ 21}$ 4.789 before and 4.968 after treatment) during study period. The water temperature shows significant positive correlation with alkalinity, BOD, Chloride, CO_2 at $P< 0.05$ level while at $P< 0.01$ level with hardness, pH and TDS. It showed negative significant correlation with COD, turbidity at $P< 0.05$ level while at $P< 0.01$ level with DO and nitrates before treatment. Whereas after treatment it shows positively significant correlation at $P< 0.05$ level with alkalinity, BOD, Chloride, and hardness while at $P< 0.01$ level with CO_2, pH, TDS. Negative significant correlation at $P< 0.05$ level with EC and turbidity while at $P< 0.01$ level with COD, DO, nitrates.







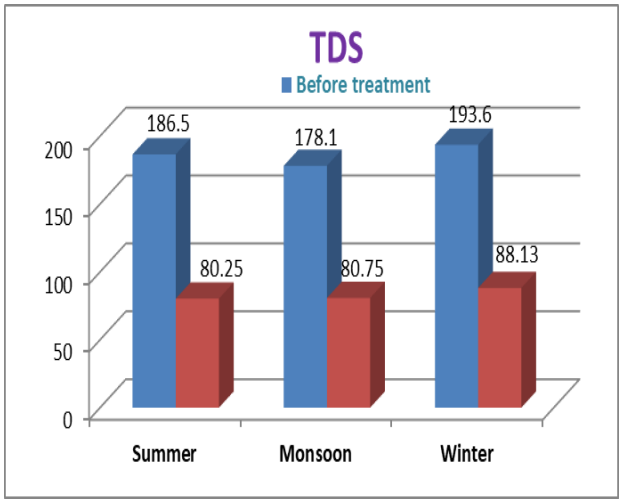


Table-2: Pearson co-relation table of Dedargaon dam (Before treatment)

	AL	BOD	Cl	CO_2	COD	DO	EC	HARD	NO	pH	TDS	TEMP	TURBID
AL	1.000												
BOD	.008	1.000											
Cl	.468*	.239	1.000										
CO_2	.181	-.005	.472*	1.000									
COD	-.145	.534**	.138	.016	1.000								
DO	-.601**	-.175	-.317*	-.646*	.109	1.000							
EC	-.332*	-.494*	-.648*	-.288	.472*	.484*	1.000						
HARD	-. 265	.443*	.484*	.365*	-.606*	-.416*	-.140	1.000					
NO	-.851**	-.399*	-.333*	-.022	-.038	.592**	.478*	-.480*	1.000				
pH	.692**	.466*	.395*	.616**	.028	-.666**	-.318*	.417*	-.703**	1.000			
TDS	.178	-.229	.401*	.429*	-.025	-.410*	-.446*	.450*	.059	.431*	1.000		
TEMP	.425*	.345*	.364*	.695*	-.651*	-.731**	-.091	.560**	-.546**	.436**	.583**	1.000	
TURBID	-.297	-.488*	-.875**	-.471*	-.041	.435*	.419*	-.107	.676**	-.114	-.284	-.336*	1.000

Table- 3: Pearson co-relation table of Dedargaon dam (After treatment)

	AL	BOD	Cl	CO_2	COD	DO	EC	HARD	NO	pH	TDS	TEMP	TURBID
AL	1.000												
BOD	.252	1.000											
Cl	.376*	.122	1.000										
CO_2	.369*	.337*	.395*	1.000									
COD	-.168	-.610**	-.125	-.497*	1.000								
DO	-.319*	.170	-.395*	-.698**	.691**	1.000							
EC	-.204	-.436*	-.423*	-.480*	.345*	.482*	1.000						
HARD	.650**	.372*	.478 *	.348*	-.344*	-.442*	-.367*	1.000					
NO	-.345*	-.688**	-.349*	-.351*	.444*	.339*	.350*	-.375*	1.000				
pH	.472*	.648*	.529**	.331*	-.556**	-.680**	-.425*	.601*	-.405*	1.000			
TDS	.426*	.049	.264	.367*	-.396*	-.617**	-.334*	.666**	-.085	.323*	1.000		
TEMP	.652*	.485*	.444*	.778**	-.744**	-.847**	-.498*	.633*	-.806**	.759**	.549**	1.000	
TURBID	-.553**	-.433*	-.394*	-.182	.423*	.451*	.423*	-.398*	.365*	-.313*	-.051	-.383*	1.000

**Correlation is significant at 0.01 level (2-tailed)
*Correlation is significant at 0.05 level (2-tailed)

Bhagde *et al* (2016 a) measured temperature 25 ^{0}C to 34 ^{0}C at two sampling stations from Aadhala River in Ahmednagar District. Bhagde *et al* (2016 b) recorded minimum temperature 30 ^{0}C in the month of December, 32 ^{0}C in August and 37 ^{o}C in the month of March from Devtale Lake in Sangamner Taluka of Ahmednager District of Maharashtra State, India. Dahegaonkar (2016) reported seasonal variation in physico-chemical parameters like water temperature the maximum water temperature (35.1 ^{0}C) in summer season and minimum (24.4 ^{0}C) in winter season, for a period of June, 2005 to May, 2007. Fule *et al* (2017) recorded the temperature range between 22.00 ^{0}C to 36.50 ^{0}C i.e. lowest in winter and highest in summer during the year 2008-09, from Sarangpuri Lake, Dist-Wardha.

pH:

The maximum before and after treatment mean values of pH was recorded in summer i.e. (7.4 ± 0.054) and (7.3 ± 0.032) respectively. It slightly decreased in monsoon i.e. (7.4 ± 0.057) and (7.1 ± 0.042) respectively, whereas during winter season it was (7.3 ± 0.043) and (7.1± 0.046) respectively, with significantly significant seasonal variations ($P< 0.05$, $F_{2\ 21}$ 0.9545 and 4.019) before and after treatment during study period. Before treatment it shows positive correlation significant level at $P< 0.05$ with alkalinity, BOD, Chloride, CO_2, hardness and TDS and at $P< 0.01$ with temperature only while it shows negative significant correlation at $P< 0.05$ level with DO, EC and nitrates. Whereas after treatment it shows significant positive correlation at $P< 0.05$ with alkalinity, Chloride, CO_2, hardness and TDS and

correlation at P< 0.01 level with temperature. While it shows negative significant correlation at P< 0.05 level with EC and nitrates and at P< 0.01 with DO.

Prasad *et al* (2014) observed the maximum pH (8.8) at site Kadiyampalli and the minimum (7.7) at Voddipalli village. Tandale and Mujawar (2014) reported that lowest pH value was noticed in the september (6.68) and high in November (7.36). They noticed that the values of pH are within the range of permissible limit of drinking water quality standards (WHO). Bhagde *et al* (2016 a) studied physico-chemical parameters of Aadhala River. They observed that the changes occur in pH and recorded pH 6.2 to 7.5. Bhagde *et al* (2016 b) observed minimum pH 7.67 in the month of August, 7.3 in December and maximum pH was noticed in the month of March i.e. 8.1. Dahegaonkar (2016) recorded maximum pH (8.15) in the month of August, 06 and minimum (7.62) in October, 2005.

Turbidity:

The maximum before and after treatment values of turbidity was recorded in monsoon i.e. (2.378 ± 0.16) and (0.633 ± 0.067) respectively. It was slightly decreased in winter i.e. (1.69 ± 0.092) and (0.544 ± 0.022) respectively, whereas it recorded minimum in summer i.e. (1.514 ± 0.17) and (0.454 ± 0.039) respectively. It was noticed with significantly significant seasonal variations (P< 0.01 and P< 0.05) F_{221} 10.66 before treatment and 3.731 after treatment during study period. Before treatment it shows significant positive correlation with DO and EC at P< 0.05 level and with nitrates at P< 0.01 level. It shows negative significant correlation with BOD, CO_2, Temperature at P< 0.05 level and at P< 0.01 level with Chloride. While after treatment it shows significant positive correlation with COD, DO, EC and Nitrates at P< 0.05 level whereas negative significant correlation at P< 0.01 with alkalinity and correlation at P< 0.05 with BOD, Chloride, hardness, pH and temperature etc.

Table – 4: Statistical Analysis of physical parameters during (2014/15)

	Season	Mean	Std. Dev.	Std. Error	F-Value	P-Value	R-Square	P value summary	Significant difference Among means (p<0.05)
Temperature									
Before Treatment	Summer	30.31	2.492	0.881	4.789	0.0193	0.3132	*	Yes
	Monsoon	30.33	1.498	0.5297					
	Winter	27.46	2.275	0.805					
After Treatment	Summer	29.94	2.361	0.8347	4.968	0.0171	0.3212	*	Yes
	Monsoon	29.6	1.266	0.4476					
	Winter	27.09	2.13	0.753					
pH									
Before Treatment	Summer	7.6	0.1808	0.0639	11.52	0.0004	0.5231	***	Yes
	Monsoon	7.4	0.1309	0.0463					
	Winter	7.3	0.119	0.042					
After Treatment	Summer	7.3	0.1195	0.0423	10.23	0.0008	0.4935	***	Yes
	Monsoon	7.2	0.0535	0.0189					
	Winter	7.1	0.141	0.05					
Turbidity									
Before Treatment	Summer	1.514	0.4693	0.1659	10.66	0.0006	0.5038	***	Yes
	Monsoon	2.378	0.4261	0.1506					
	Winter	1.69	0.259	0.0916					
After Treatment	Summer	0.4538	0.1112	0.0394	3.731	0.0411	0.2622	*	Yes
	Monsoon	0.6325	0.1881	0.06651					
	Winter	0.544	0.06	0.0216					
TDS									
Before Treatment	Summer	186.5	23.9	8.449	1.134	0.3407	0.09746	ns	No
	Monsoon	178.1	14.41	5.094					
	Winter	193.6	22.26	7.869					
After Treatment	Summer	80.25	24.05	8.504	0.5422	0.5894	0.04911	ns	No
	Monsoon	80.75	6.649	2.351					
	Winter	88.13	15.42	5.453					

Tali *et al* (2012) studied the alterations of turbidity within Aug-2010 to Jul-2011 the values of turbidity ranges from 3.9 NTU and 22.8 NTU at sitte I and from 3.5 NTU and 23.8 NTU at site II, which was lowest in summer 2011 at site II and highest in the monsoon at site II of the River Narmada at Madhya Pradesh India. Dhale and Pachkore (2012) recorded the values of turbidity ranges from 0.1 to 0.4 NTU which fall under the desirable limits prescribed by WHO. Sahu *et al* (2015) showed the lower turbidity i.e. 3 NTU at station S1 and higher turbidity i.e. 21 NTU at station S2. It was noticed due to the disturbance by anthropogenic activity.

TDS:

The maximum before and after treatment values of water TDS was recorded in winter i.e. (193.6 ± 7.87) and (88.13 ± 5.46) respectively. It was slightly decrease in summer i.e. (186.5 ± 8.45) and (80.25 ± 8.51) respectively, while it was recorded in monsoon i.e. (178.1 ± 5.094) and (80.75 ± 2.356) respectively, with significantly significant seasonal variations ($P< 0.01$ and $P< 0.05$) $F_{2\ 21}$ 1.134 before treatment and 0.542 after treatment during study period. Before treatment it shows significant positive correlation at $P< 0.05$ with Chloride, CO_2, hardness and pH whereas correlation at $P< 0.01$ with temperature. It shows negative significant correlation with DO and EC at $P< 0.05$ level. While after treatment it shows significant positive correlation at $P< 0.01$ with hardness as well as temperature and at $P< 0.05$ level with alkalinity CO_2 and pH. It shows negative significant correlation at $P< 0.01$ with DO and at $P< 0.05$ level with COD and EC.

Lubal *et al* (2012) recorded the fluctuation of TDS values in the range of 178 mg/ L to 290 mg/ L. They noticed the maximum values of TDS in May and minimum in December from at Mhaswad water reservoir of Satara. According to Aggarwal and Arora (2012) of Kaushalya River TDS values ranged between 152mg/ L to 252 mg/ L and stated that the water with TDS can be considered to be good. Dhale and Pachkore (2012) recorded Total Dissolved Solid (TDS) noted from 552.00 mg/ L to 1183.00 mg/ L. Tali *et al* (2012) recorded the TDS values ranged as 230 mg/ L to 345 mg/ L from site I and 190 mg/ L to 360 mg/ L at site II, Which was minimum in January, 2011 and maximum in the month of July, 2011.

CONCLUSION

According to observations, considering the physical analysis the water samples were found to permissible limit. Related recommended standards assessment of the dam water quality parameters values, it was observed that 06 parameters i.e. Color, Odor, Temperature, pH, Turbidity, TDS during study period all the samples were found within desirable limit for domestic as well as drinking water. It was observed that the maximum possible concentration of Turbidity in the rainy season. As compare to after treatment water samples, before treatment water samples found unpleasant, that may be polluted due to flooding, agricultural runoff, anthropogenic activities etc.

Conflicts of interest: The authors stated that no conflicts of interest.

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