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AN INVESTIGATION OF PHYSICO-CHEMICAL PARAMETERS OF WALDEVI DAM WATER NEAR NASHIK (M.S.), INDIA

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ABSTRACT

A study of Physico-chemical parameters of Waldevi dam water was carried out during February 2015 to January 2016. Waldevi is an earth fill dam situated at the Pimplad village near Nashik city. Physical characters like Temperature, transparency, total dissolved solid, Rainfall and Chemical Parameters like Dissolved oxygen, pH, free carbon dioxide, Hardness (Ca & Mg), Total Alkalinity, Chlorides, and Biochemical oxygen Demand were studied during the study. For this study, water samples were collected after an interval of a month from three selected sites of the dam and were studied with their physico-chemical parameters with standard methods. It is observed that all the selected physico-chemical parameters show seasonal variation and also fluctuated by different anthropogenic activities. Also some of them are interdependent and get changed with other parameters,

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INTRODUCTION

India is one of the countries in the world with a great diversity in respect to flora, fauna, climate and culture. Though water has acquired enormous volume on the earth surface, only a small portion of it is actually available as resource for human and animals. It is noted that, more than 97% of total water occurs in the form of sea and ocean, whose salinity makes it useless, while fresh water makes up only 2.6% (Tali *et al.*, 2012). Water is one of the abundantly available natural resource, which has great importance for the survival of all biotic factors on the earth surface. It is widely used by human being for drinking, irrigation, fish production, industrial cooling, power generation and many. Good quality water is required for all living organisms. Quality of water depends upon the concentration of various solutes at a given place and time. Water quality parameter provides the basis for judging the suitability of water for its designated uses and to improve existing conditions (Shinde *et al.*, 2011). The water quality in ponds, rivers and streams may vary depending on the local geological morphology, vegetation and land use (modification by human activities such as agriculture, industrialization and urbanization) in the catchment. Industries, agriculture and urban settlements produce nutrients (sewage effluent and fertilizers) and toxic substance such as organic and inorganic pollutants and other chemicals including heavy metals. Water becomes polluted, when these substances release in the water and alter its natural characters (Water and river commission, 1997). Many workers throughout the world made attempts to study various types of water bodies with their physicochemical properties. They include Abhachire (2014), Meghla *et al.* (2013), Bechir *et al.* (2008), Minukumari *et al.* (2013), Choudhary *et al.* (2011) etc. Waldevi is an earth fill dam constructed in 1995 on Waldevi River near Pimplad village of Nashik tehsil, about 10 km away from city. The total capacity of storage is 33,720.00 km3 (8,089.86 cu mi) and 3,437 km2 (1,327 sq mi) surface area. The height of the dam above its lowest foundation is 36.4 m (119 ft) while the length is 1,890 m (6,200 ft). The bottom of reservoir is rocky. This too posses water throughout the year. Water of both reservoirs is formerly used for irrigation but also for washing, bathing and pisciculture activities. The reservoir stores rain water received from adjoining catchment area and is influenced by some anthropogenic activities.

Table1. Physicochemical parameters of Waldevi dam water

Month/ Parameter	Atm. Temp. (°C)	Water Temp. (°C)	Rain fall (mm)	Transpa-rency	PH	TDS (mg/l)	Total Hardness (mg/l)	Chlorides (mg/l)	DO (mg/l)	Free CO_2 (mg/l)	Total Alkalinity (mg/l)	BOD (mg/l)
February 2015	34.7	28.7	5.5	84.0	7.9	185	141	14.6	6.8	3.3	153	3.1
March 2015	38.1	28.5	50.6	75.6	8.0	196	142	18.6	6.5	2.7	159	3.3
April 2015	40.2	31.1	1.5	64.5	8.3	203	146	21.7	6.7	2.4	158	3.5
May 2015	40.1	34.1	113.8	50.3	8.4	208	152	23.3	6.1	2.9	164	3.8
June 2015	37.2	33.1	116.7	32.3	8.3	185	149	19.3	5.9	3.2	155	3.6
July 2015	32.2	29.5	47.3	32.3	8.0	171	152	23.2	6.1	3.7	138	1.6
August 2015	30.7	28.1	265	26.8	7.9	166	149	31.9	6.3	4.1	132	1.8
September 2015	32.7	28.7	55	37.1	8.0	159	145	41.2	6.4	4.2	139	2.0
October 2015	34.3	29.3	9.8	53.1	7.8	160	141	37.8	6.7	4.2	137	2.2
November 2015	33.3	30.1	0.0	81.1	7.3	158	137	27.0	7.3	4.9	145	2.5
December 2015	33.9	28.2	0.0	97.8	7.6	156	129	15.5	7.5	5.1	145	2.7
January 2016	34.2	27.8	0.0	91.8	7.7	167	133	6.9	6.9	3.2	151	2.7

In the present investigation, authors studied different physical and chemical parameters of the Waldevi dam water. Physical characters like Temperature, transparency, total dissolved solid, Rainfall and Chemical Parameters like Dissolved oxygen, pH, free carbon dioxide, Hardness (Ca & Mg), Total Alkalinity, Chlorides, and Biochemical oxygen Demand were studied during the study

MATERIALS AND METHODS

Authors adopted standard methods given by different workers to carry out this study. Water samples were collected in the morning hours. The parameters like Atmospheric temperature, water temperature, PH, water transparency were checked out on the field itself and rest of parameters including, DO, CO2, TDS, Total hardness, BOD etc were tested in the laboratory. Readings were taken in the first week of every month during February 2015 to January 2016. As per the weather conditions three seasons appears distinguishable.

- Winter- November to early February
- Summer- Late February to Mid June
- Monsoon- Mid June to October.

During this study authors selected three different sites of the pond for sample collection. These three sites were named as W_1, W_2 & W_3. An average result of three sites is provided in here. Water samples were collected from all the selected sites after an interval of month and all selected physicochemical parameters were analyzed by using standard methods (Trivedy & Goel, 1986, APHA, 1996, Kodarkar, 1998)

RESULTS AND DISCUSSION

Atmospheric temperature

In the present investigation, the atmospheric temperature recorded was ranging from 30.7 °C to 40.2 °C. Maximum temperature was recorded in the month of April 2015, 40.2 °C and minimum of 30.7 °C was recorded in the month of August 2015. Atmospheric temperature is an important physical factor indicates the quality of water. It fluctuates other physical and chemical parameters like transparency, PH etc. It also affects greatly on the biological parameters like abundance of phytoplanktons and zooplanktons and plays a vital role in regulating metabolism aquatic organisms.

Water temperature

The water temperature recorded during the study was ranging from 27.8°C to 34.1 C° in the months of January 2016 and May 2015 respectively.

Rain fall

Rainfall is an important physical parameter which influences all the physico-chemical parameters. At Waldevi dam area maximum rainfall was recorded in the month of August i.e. 265 mm and minimum, 0 mm or null in the months November, December and January.

Transparency

Transparency of water was generally measured during 12 pm to 1 pm by using a standard size Secchi disc. It was observed that, water was more transparent in the month December and less transparent in August. Transparency of water is commonly affected by rainfall in the catchment area due to addition of soil particles in the water.

pH

It is the measure of intensity and of acidity and alkalinity and measures hydrogen ion concentration in water. The range of pH observed in the Waldevi water is 7.3 to 8.4. It was maximum in the month of May and minimum during the months of November. PH of water changes significantly by the disposal of industrial waste and drainage.

Total Dissolved Solids (TDS)

It denotes mainly the various kinds of minerals present in the water. Sometimes organic substances present in the water may also include under total dissolved solids. Concentration of dissolved solids is an important parameter in drinking water and other water quality standards. In Waldevi water the range of TDS observed was 156 mg/l in December to 208 mg/l in May.

Total Hardness

129 mg/l to 152 mg/l is an observed range of total hardness in Waldevi dam water. It was observed maximum in the months May and July and minimum in December. Hardness is the property of water which prevents the lather formation with

soap and increases the boiling point of water. Principal cations imparting hardness are calcium and magnesium.

Chlorides

Chlorides occur naturally in all types of waters. The most common source of chlorides in the water is the discharge of domestic sewage. They harmless up to 1500 mg/l concentration but produce a salty taste at 250-500 mg/l level. In Waldevi dam water, very less amount of chlorides were observed which ranges from 6.9 mg/l to 41.2 mg/l.

Dissolved Oxygen (DO)

Dissolved oxygen reflects the physical and biological processes prevailing in the water. Its presence is essential to maintain the higher forms of biological life in the water. Low oxygen in water can kill fishes and other organisms in the water. So it is very essential component and must be available in water as it is life supporting gas for biological entities. 5.9 mg/l to 7.5 mg/l is a range of dissolved oxygen found in Waldevi dam water, minimum in June and maximum in December.

Free Carbon dioxide (Free CO_2)

The free carbon dioxide of Waldevi dam varied from 2.4 mg/l to 5.4 mg/l. The maximum of 5.1 mg/l was recorded in December and the minimum of 2.4 mg/l was recorded in April. The presence of free carbon dioxide in water is very essential for the photosynthesis process of phytoplanktons and helpful for the regulation of aquatic food chain.

Total Alkalinity

Alkalinity of water is the capacity to neutralize a strong acid and is characterized by the presence of all hydroxyl ions capable of combining the hydrogen ion. The observed range of total alkalinity in the present study is 132 mg/l to 164 mg/l, minimum in the month August and maximum in May.

Biochemical Oxygen Demand (BOD)

It is the amount of oxygen utilized by microorganisms in stabilizing the organic matter. The maximum BOD was observed in Waldevi dam water is 3.8 mg/l in the month May and minimum 1.6 mg/l in the month July.

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