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RESEARCH ARTICLE

STUDY OF PHYSICO-CHEMICAL PARAMETERS OF ANJANERI POND NEAR NASHIK (M.S.), INDIA

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ABSTRACT

Water resources in India have reached a point of crisis due to unplanned urbanization and Industrialization. Advanced human activities over the recent past years are causing greater threats on these freshwater resources, resulting in changing their features. A study of Physico-chemical parameters of Anjneri pond water was carried out during February 2015 to January 2016. 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. It is observed that all the selected physico-chemical parameters show seasonal variation and also fluctuated by anthropogenic activities.

INTRODUCTION

Water resources in India have reached a point of crisis due to unplanned urbanization and Industrialization. Advanced human activities over the recent past years are causing greater threats on these freshwater resources, resulting in changing their features. Increasing population and its necessities have lead to the deterioration of surface and sub surface water. The factors responsible for degradation of water quality need to be evaluated so as to take proper steps before the situation becomes worst and uncontrollable. In natural lakes and reservoirs created by man for different purposes like tourism, fishing, production of hydroelectric power, irrigation and for the purpose of drinking water, algal blooms form a problem throughout the world which leads further in the formation of biotoxins in the water. It is caused due to release of excess nutrients in the reservoir (Bartolelli *et al.*, 2005). Thus, study of different water parameters is very important to understand metabolic events in aquatic ecosystems. Climatic factors such as rainfall, temperature, pressure, humidity, PH, oxygen and carbon dioxide concentration etc. play an important role to maintain the quality of water. A sound knowledge of these factors help in understanding the complex processes of interactions between the biotic and abiotic interrelationship in water bodies. The total life of the world depends on water and hence the hydrobiological study is very much essential to understand the relationship between its different trophic levels and food webs. Rivers, lakes, dams and ponds are important fresh water habitats throughout many regions of the world, although the amount of water in them constitutes only a minute fraction of the total freshwater resource on earth (Christer and Lars-Anders, 2002). A study on physicochemical parameters of different water bodies were carried out by many workers throughout the world. Bhadja and Vaghela (2013), made a hydrobiological study on a freshwater reservoir in Gujrat state. They studied different 12 physico-chemical parameters of water including temperature, PH, TDS etc. Meghla *et al.* (2013), assessed physico-chemical properties of water from Turang river in Dhaka city. Turang river is highly polluted due to direct release of untreated waste water from city and industries, which caused abnormal exceed in the concentration of nitrogen, phosphorus, alkalinity and hardness of river water. Other parameters like PH, electric conductivity, total dissolved solids, and cadmium concentration are exceeded more than permissible limits. kumar *et al.* (2013), carried out a research on two reservoirs of Narmada river, Indrasagar dam and Omkareshwar dam. They studied some physicochemical parameters of the both reservoirs comparatively including temperature, BOD, Chlorides, Temperature, PH, sulphates, T.D.S and Hardness. They found that all the above parameters fluctuate with the seasonal

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changes and some of them are interrelated with each other. Kolhe *et al.* (2014) Discussed Physico-Chemical Water Parameters of Gangapur dam of Nashik district. It is a earth fill dam on constructed on Godavari river, and water is used mainly for agricultural, drinking and domestic use for Nashik city. Water samples analyzed for pH, EC, DO, temperature, TDS, suspended solids, BOD. The correlation matrix shows positive correlation between PH & Temperature. Authors concluded that, the water of Gangapur dam is safe for all types of human use including drinking, domestic use and for agriculture.

In the present work authors studied different physical and chemical parameters of the Anjneri pond water which is a small water body located at Anjaneri village nearby Nashik - Tryambakeshwar highway. It is about 24 kms from Nashik city. This pond is located at latitude 190 56' 20" and 730 55' 36" longitude. The total length is 803.12 m (2634.90 ft). In this pond, water is stored from the hills nearby Anjneri village. Though this pond is away from any village, human interference makes this pond polluted partially. People from adjoining villages continuously engaged to utilize water from the same for many purposes. This includes, Washing clothes, animals and vehicles, bathing, irrigation, fishing, immersing statue made from plaster of Paris especially on the occasion of Ganesh and Navratra festival. Uncontrolled irrigation practices leaves very less amount of water in the lake at the end of summer. All these practices change the quality of water which will adversely affect aquatic fauna especially zooplanktons.

MATERIALS AND METHODS

For the completion of this study, authors used standard methods given by different workers. 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 while all other parameters including, DO, CO2, TDS, Total hardness, BOD etc were tested in the laboratory. Readings were taken in the second week of every month during February 2015 to January 2016. As per the weather conditions three seasons appears distinguishable.

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

During this study author selected three different sites of the pond for sample collection. These three sites were named as A_1, A_2 & A_3 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 and Goel, 1986, APHA, 1996, Kodarkar, 1998).

RESULTS AND DISCUSSION

Atmospheric temperature

In the present investigation, the atmospheric temperature recorded was ranging from 30.9 °C to 40.5 °C. Maximum temperature was recorded in the month of May 40.5 °C and minimum of 30.9 °C was recorded in the month of August. Average atmospheric temperature recorded at the pond is 35.4° C. 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 phytoplankton's and zooplanktons and plays a vital role in regulating metabolism aquatic organisms.

Water temperature

The water temperature recorded during the study was ranging from 26.5°C to 34.8 ° in the months of January and May respectively. 29.6 °C is the average water temperature recorded.

Rain fall

Rainfall is an important physical parameter which influences all the physico-chemical parameters. At Anjaneri pond area maximum rainfall was recorded in the month of May i.e. 331.9 mm and minimum, 1 mm in April. Average rainfall at the catchment area of pond was 79.3 mm.

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. Average transparency observed in the pond water was 55.05.

Table 1. Physicochemical parameters of Anjaneri pond 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	35.5	28.1	1.4	71	7.8	181	112	10.3	6.7	3.1	136	3.7
March 2015	38.8	28.2	16.3	67	8.0	186	117	13.2	6.3	2.7	137	3.9
April 2015	40.2	31.2	1.0	54.6	8.0	194	115	21.2	6.0	2.4	130	4.0
May 2015	40.5	34.8	42.7	43.8	8.4	201	113	31.8	5.6	3.5	140	4.0
June 2015	37.5	33.7	26.2	28.1	8.2	192	110	17.1	4.9	3.9	143	4.2
July 2015	32.4	30.3	331.9	32.5	7.9	185	113	21.0	5.7	4.3	137	2.8
August 2015	30.9	28.2	277.7	25.0	7.7	174	111	25.0	6.2	4.6	130	3.0
September 2015	32.9	28.1	145.9	38.0	7.6	166	108	27.0	6.8	5.0	127	3.2
October 2015	34.5	29.1	43.1	52.5	7.3	163	106	37.9	7.2	5.4	123	3.4
November 2015	33.3	30.0	53.9	73.1	7.3	156	104	21.5	7.3	5.1	130	3.6
December 2015	34.0	28.1	6.7	96.0	7.5	152	103	18.1	7.8	5.1	136	3.6
January 2016	34.5	26.5	5.5	79.0	8.0	158	113	06.3	6.3	3.0	136	3.0
Average	35.4	29.6	79.3	55.05	7.8	175	110	20.8	6.4	4.0	133	3.5

pH

It is the measure of intensity and of acidity and alkalinity and measures hydrogen ion concentration in water. The average PH recorded during the study period was 7.8. The range of pH observed in the Anjaneri pond water is 7.3 to 8.4. It was maximum in the month of May and minimum during the months of October and 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. An average TDS recorded in the present study was 175 mg/l. In Anjaneri water the range of TDS observed was 152 mg/l in December to 194 mg/l in May.

Total Hardness

103 mg/l to 117 mg/l is an observed range of total hardness in Anjaneri pond water. It was observed maximum in March and minimum in December. Average total hardness was recorded as 110 mg/l. 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 Anjaneri water, very less amount of chlorides were observed which ranges from 6.3 mg/l to 37.9 mg/l. An average concentration observed in Anjaneri water was 20.8 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. 4.9 mg/l to 7.8 mg/l is a range of dissolved oxygen found in Anjaneri pond water, minimum in June and maximum in December. An average 6.4 mg/l dissolved oxygen was recorded in the present study.

Free Carbon dioxide (Free CO_2)

The free carbon dioxide of Anjaneri dam varied from 2.4 mg/l to 5.4 mg/l. The maximum of 5.4 mg/l was recorded in October and the minimum of 2.4 mg/l was recorded in April. In the present investigation an average CO_2 concentration was 4 mg/l.

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 average concentration of alkalinity of present water body was recorded as 133 mg/l. The observed range of total alkalinity in the present study is 123mg/l -143 mg/l, minimum in the month October and maximum in June.

Biochemical Oxygen Demand (BOD)

It is the amount of oxygen utilized by microorganisms in stabilizing the organic matter. The maximum BOD was observed in Anjaneri pond water is 4.2in the month June and minimum 2.8 in the month July. Average BOD in the present water was 3.5 mg/l.

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