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# Evaluation of BOD and COD parameters with their influence on phytoplankton from Sudha Reservoir near Bhokar, Maharashtra (India)

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**Abstract**

Water is a fundamental need of human race. The water should be potable and clean for drinking along with agricultural work. For clearing water and makes water body oxygenated, phytoplankton plays an important role in aquatic ecosystem. Presence of adequate number of phytoplankton indicates the healthiness of waterbodies. However, when it surpasses its quantity, it indicates the waterbody become polluted with dissolved nutrients via micro-organisms and other aquatic flora-fauna. The micro-organism plays an important to convert complex matter into simplest form by using available dissolved oxygen consequences, hypoxia rises. The industrial waste releases into the water body causes drastic changes in phytoplankton productivity rate. The waterbody rises towards BOD and COD conditions by the influence of impurities inducing etc.

This investigation aims to study the correlation between phytoplankton productivity with Biochemical oxygen demand and Chemical oxygen demand. The water samples were collected from Sudha reservoir during the January to December 2019 respectively. The results showed there were no effect of BOD and COD on plankton productivity.

**Key words :** BOD and COD Evaluation, Phytoplankton, Freshwater studies.

The rapid growth of urban areas has affected surface and ground water quality due to overexploitation of resources and improper waste disposal practices. Hence, there is always a need for and concern over the protection and management of surface water and groundwater quality to meet the water demand. One of the major problems in contemporary ecology is the path of metals and nutrients introduced into aquatic environments due to anthropogenic activities.

Anthropogenic activities lead to water

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pollution, relates to sewage (industrial and community), with inclusion of chemical matter from dumping grounds of different waste materials[5]. Human disturbances are continuously harming the environment through many ways. Anthropogenic activities are widely responsible to increase the toxic metals especially in aquatic ecosystem and it is become an important worldwide problem[14]. Nowadays a pollution of water is at worst level, most of our water reservoir are gradually become contaminated due to the addition of foreign materials from the surroundings.

*Plankton in Freshwater :*

Phytoplankton plays an important role, including algae and cyanobacteria in aquatic ecosystem and they are the primary producers. Aquaculture organisms have to obtain all their nutritional requirements, except for part of the mineral requirements, through the food they consume[12]. In nature, most of the organisms subsist on living food consisting of plants and animals obtained from the environment, but some do ingest and utilize detritus along with associated organisms. The plant components of all the plankton are the phytoplankton and are the primary producers for the entire aquatic bodies.

*Study area :*

Bhokar is the Tehsil place in Nanded district of Maharashtra, the Sudha reservoir constructed earlier and it is on the way to Kinwat and near Bhokar towards eastern. The reservoir is situated $19_0$ 15' latitude $73_0$ 43' longitude. The catchments area of the reservoir is about 105.67 sq. km. Sudha River is emerging from Sitakhandi near Bhokar on the way to Nanded highways.

Table-1. Showing the Sampling Sites located on the Sudha reservoir

| Sampling Site | Latitude | Longitude |
|---|---|---|
| 1 | 19°15'6.55"N | 77°43'1.27"E |
| 2 | 19°14'48.19"N | 77°42'51.26"E |
| 3 | 19°14'32.98"N | 77°42'21.03"E |
| 4 | 19°14'49.76"N | 77°41'55.24"E |


Fig. 1. The Different sites of Water Sampling Locations of Sudha reservoir Google Earth.


Fig. 2. Sampling of water form S1 site.


Fig. 3. Water sample collection at site S2.

Fig. 4. A view of Sudha reservoir with water supply Unit near Bhokar City.


Fig. 5. Water sampling from site S3.

Fig. 6. General view of water sampling on site.

The flow of water is from west to east in the direction. The area covered by this project is about 175.385 hectares. This project is highly benefited by several villages along with entire city of Bhokar. Several villages are benefited by this dam in various sections.

Water samples were collected from Sudha reservoir nearly Four different sites as ($SS_1$, SS2, $SS_3$ and $SS_4$) the points of locations were fixed earlier and the samples collected in pre-cleaned plastic containers also sealed on site from all points and labelled. All the water samples brought in the laboratory for systematic analysis. The water analysis was carried out accuracy and with following standard methods which are widely useful, also the phytoplankton as biota studies carried accurately.

The Biochemical Oxygen Demand is carried out by using 5 days process with Winkler's method by titrimetric method. Chemical Oxygen Demand was carried out with the help of reflux method using strong sulphuric acid[2]. The evaluation of phytoplankton carried out with identification also with in number with Sedgwick rafter slide.

The results found in this investigation was given in the (table-2 and 3), the monitoring and evaluation of all the values of selected parameters were studied for BOD and COD. Both the parameters are significant in deciding the water bodies are polluted or else, it is important to detect the status of water bodies for healthy aquatic ecosystem with productivity of plankton and it will be rich source of primary producers for other organisms[11].

Yennawar *et al*.,[15], studied the water quality assessment of Nagzari dam of Maharashtra. They studied this parameter during for a period during year 2012 and observed the BOD values minimum as 2.38 mg/L and maximum as 30 mg/L.

Nagargoje and Bhosle *et al*.,[8], they made assessment of water quality parameters for this freshwater body as named Nagzari dam of Maharashtra especially for pollution if any in this reservoir. They evaluated the BOD and COD parameters of this water body during year 2005-06, they have estimated and noted BOD values as 1.2 mg/L minimum and 3.4 mg/L maximum as well as COD values as 2.5 mg/L minimum and maximum 6.7 mg/L respectively.

Rakh and Bhosle[10], investigated the Vashishti river water quality of Chiplun city during January to December 2004, this study was conducted for study of sources of pollution in this river. They worked and noted the concentration of BOD as less 2.0 mg/L and high 4.0 mg/L, also another chemical parameter which is important in deciding the water pollution and its was estimated COD as low 4 mg/L and high 18 mg/L.

Pushpam *et. al.*,[9], estimated the concentration of biochemical oxygen demand in Nagarcoli Nagraja temple water tank and Suchindram thanumalayan swamy temple's water tank district Kanyakumari of state Tamil Nadu during January to December 2009. They observed that the concentration of BOD ranged as 0.2 mg/L to 9 mg/L and 0.6 to 9.1 mg/L respectively. This may be of anthropogenic activities around the pond.

Ahiarakwem *et. al.*,[1], estimated the BOD values of water samples from Nijaba river situated Niger delta basin of south eastern Nigeria. They observed twice *i.e.*, January-December 2003 and January -December 2008, they found and noted the values ranged as 2.2 to 3.0 mg/L to 3.2 to 4.8 mg/L during the period of 2003, 2008 respectively.

Mhaske and Talwankar[7], evaluated the water samples for BOD analysis from Khadakpurna reservoir of district Buldhana of Maharashtra state, it was found that BOD parameter and monitored the results during the period of August 2013 to July 2015. They recognized the BOD level varies in the range of 1.2 to 4.2 mg/L respectively.

Luharia *et. al.*,[6], were studied the BOD parameter analysis of water samples from Gawrala and Vinjasan lake of Bhadravati of district Chandrapur, Maharashtra, they noticed the BOD values as low to high from 0.11 to 1.6 mg/L and 0.10 to 1.4 mg/L.

Vijaykumar and Kumaravijaya[13], evaluated the level of BOD concentration from Kundpura Mangrove Forest of Karnataka during April 2011 to March 2012. They detected the BOD concentration and placed as between 0 mg/L in the month of August at sampling site 3 and 3.65 mg/L at sampling site 3 during the month of October.

Aweng and Maketab[3], monitored and studied the physico-chemical parameters of three different water bodies in Sungai Endau watershed, Kluang, Johor, Malaysia. They observed the level of COD from this lake which was ranged as 1 to 3 mg/L at Denger river, 12 to 27 mg/L at Mengkibol river during the period of November 2008 to June 2010, revealed anthropogenic activities as sources engulf itself.

Table-2. The values of Biochemical Oxygen Demand (mg/L) found during January to December 2019 from different Sampling Sites.

| Month | Sampling Sites | | | |
|---|---|---|---|---|
| | $SS_1$ | $SS_2$ | $SS_3$ | $SS_4$ |
| January | 21 | 22.5 | 22 | 23 |
| February | 24 | 24.5 | 23 | 24 |
| March | 23 | 23 | 24 | 24.5 |
| April | 24 | 25 | 24 | 23.5 |
| May | 29 | 28 | 28.5 | 30 |
| June | 34 | 35 | 33 | 32.5 |
| July | 31 | 30.5 | 32 | 32.5 |
| August | 26 | 25 | 25.5 | 24 |
| September | 29 | 28 | 27 | 27.5 |
| October | 28 | 27 | 28.5 | 29 |
| November | 26 | 27.5 | 25 | 26 |
| December | 27 | 27.5 | 25 | 26.5 |

Bhagat. *et. al*.,[4], observed the values of COD concentration of well water villages of Roha tehsil of state Maharashtra in the period of March 2015 to June 2016. They noticed that the concentration of COD level varies from 4 to 30.2 mg/L.

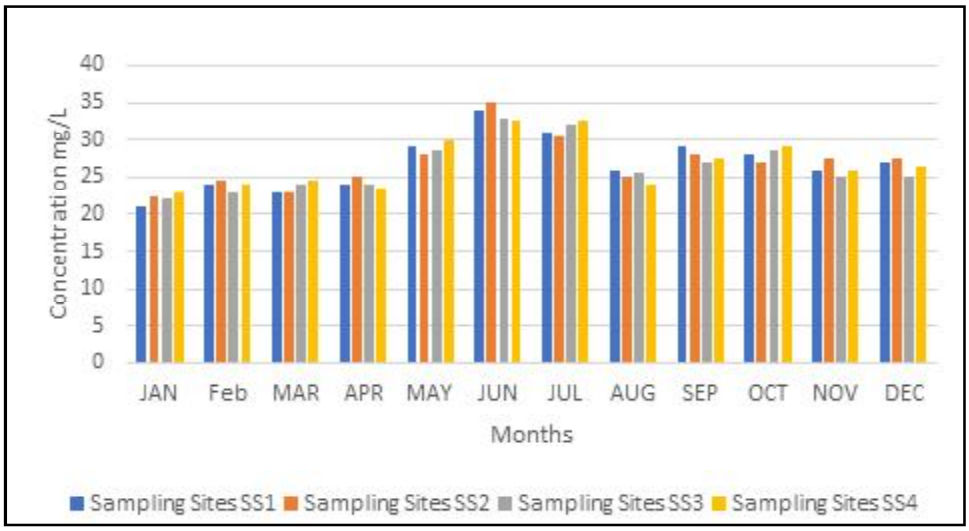


Fig. 7. The values of Biochemical Oxygen Demand (mg/L) observed during year 2019.

Table-3. The values of Chemical Oxygen Demand (mg/L) observed during period of January to December 2019

| Month | Sampling Sites | | | |
|---|---|---|---|---|
| | $SS_1$ | $SS_2$ | $SS_3$ | $SS_4$ |
| January | 1.6 | 1.3 | 1.4 | 1.4 |
| February | 1.5 | 1.4 | 1.3 | 1.5 |
| March | 1.7 | 1.4 | 1.8 | 1.8 |
| April | 1.9 | 1.8 | 1.7 | 1.9 |
| May | 1.9 | 1.8 | 1.9 | 1.7 |
| June | 2.5 | 2.6 | 2.4 | 2.4 |
| July | 3.1 | 3.4 | 3.2 | 3.1 |
| August | 3.3 | 3.2 | 3.1 | 3.6 |
| September | 4 | 4.2 | 4.1 | 4 |
| October | 3.9 | 3.8 | 3.7 | 3.4 |
| November | 3.5 | 3.4 | 3.7 | 3.1 |
| December | 2.5 | 2.4 | 2.6 | 2.3 |

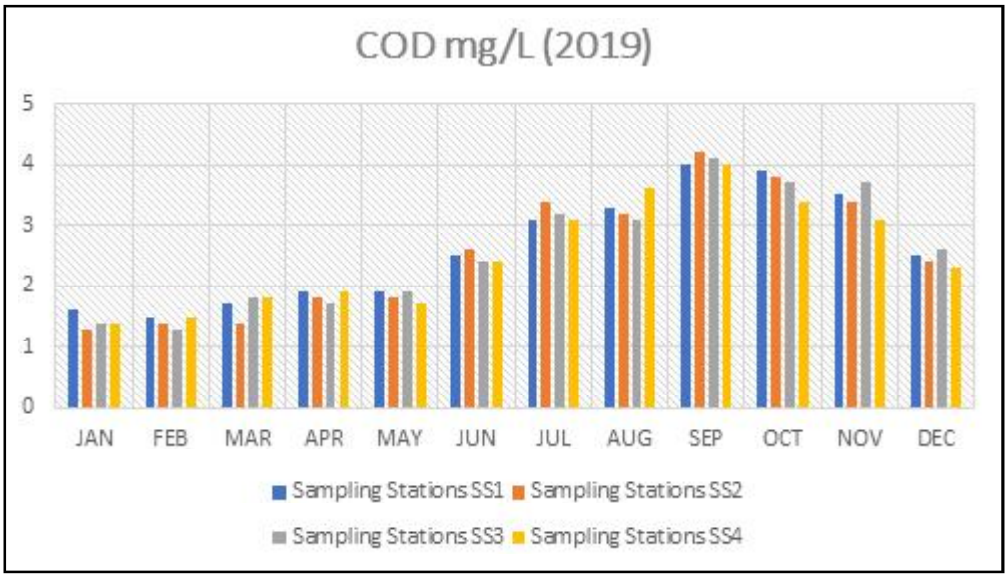


Fig. 8. The values of Chemical Oxygen Demand (mg/L) observed during year 2019.

With the overall study from four different sites as mentioned in the table and figures it is clear that the obtained values of BOD and COD are within the permissible limit. The plankton in this water body found to be quite well, which will be the indication of healthy aquatic ecosystem. Also compared with our observed values, this water body does not have the excessive BOD and COD concentrations, hence this aquatic water body nearly free form pollution sources. However, Sudha reservoir is a rich source of plankton and presently not having pollution load. The present undertaken analytical work and values obtained will be significant for future line of work.

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