Study on Physico-Chemical parameters of Yaldali Dam, Parbhani (M.S.), India.

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Abstract

The Yaldari Dam is the most important dam in Parbhani District, which provide water for drinking as well as Agricultural use. As we know the Dam is constructed on the basis of the flow of rivers due to that it brings about changes in abiotic and biotic factors compare to untamed rivers and the response of each river to dam differs. So that investigation of water quality parameters is necessary. During the study periods we investigated the both Physical as well as Chemical parameters of Yaldari Dam. The dam water is safe for the use for drinking and agricultural use.

Keywords: Physicochemical Parametrs, Yeldari Dam, Parbhani.

1. Introduction

The physico-chemical parameters are the major factors that control the dynamics and structure of the phytoplankton of aquatic ecosystem. Changes in physico-chemical parameters directly affect the species composition of any ecosystem. Seasonal variations of such parameters influence the distribution, periodicity and quantitative and qualitative composition of biota. Limnology was studied with reference to the organism especially Plankton. Zooplanktons are extremely responsive to change in the environment and thus indicate environmental changes and fluctuations that may occur; zooplankton community fluctuates according to physico-chemical parameters of the environment**.** The fresh water available in dam is useful as potable, domestic, washing, bathing agriculture and also for fishing. The nature of water is

depends on the chemicals are found in it and its effects are shown on biotic factors those depends on sources. Physical factors are effective for improvement of water bodies dependent on fresh water. Micro-organisms like zooplanktons and phytoplanktons play a lead role maintaining quality of water. Improvement in water quality is related with rich fauna and civilization progresses. Ponds, as sources of water, are of fundamental importance to human being. Monitoring of water quality is initiative step to be taken up for the management and conservation of any aquatic ecosystem. Hence, an assessment was conducted to Studies on Inter-Relationship of Planktonic Animal and Physicochemical Parameter of Yeldari dam located in Parbhani District (Maharashtra). The nutrients, primary production, temperature, abundance of predators and competitors, and potential food resources are important factors influencing the structure of rotifer community Even though most rotifers commonly exhibit maximal densities in early summer, in temperate regions they show wide range of temperature tolerance Various rotifer taxa serve as useful bio indicators of water quality of environments within the limits of Limnosaprobity. (**Ekhande** *et al.,* **2013).**

2. Materials and Method

The Yeldari dam which is located 15 km distances away from Jintur city in the Yeldari village (rural area) at the GPS latitude N 190 43' 12.4'' Latitude N 190 43' 12.4" Longitude E 760 43' 55". Yeldari dam is fresh water body built on Purna River which is sub Basin of Godavari River. This dam has spread on large agricultural area there are so many villages were came under the this dam during construction i.e. Kinhi, Kawatha, Amberwadi, Bamni, Wazar and Sawangi, Sonsawangi and Belkhi The present study has been undertaken 1st time on Yeldari dam to know the climatic changes as per the sites and species richness.

Limnological survey of Yeldari dam: proposed research is undertaken to study the limnology yeldari dam, to fulfill the objectives of proposed research work,

water samples will be collected for twelve month (Jan to Dec 2019) from four different sampling sites.
Sampling site: 1 located on east direction of dam.
Sampling site: 2 located on west direction of dam.
Sampling site: 3 located on north direction of dam.
Sampling site: 4 located in south direction of dam.
Some of the physical parameters and essential noting such as date and time of sampling shall be made on the site of sample collection. Water shall be collected in plastic containers and BOD bottles, for further analysis Samples are brought to the laboratory of P. G. and Research Department of Zoology R. A. College Washim in sampling bottles. Physical parameters such as, Temperature, pH, Conductivity, Turbidity, Total Dissolved Solids and chemical parameters such as DO (dissolved oxygen), free CO_2 (free carbon dioxide), CO_3 (carbonate), HCO_3 (bicarbonate), Total Hardness, Calcium hardness, Chloride, Salinity, phosphate, Ammonia, Nitrite, Nitrate, Sulphates, Silicates, BOD (biological oxygen demand) and COD (chemical oxygen demand) will be analyzed by following the methods suggested in APHA (1998) and Dhanpathi (2006).

3. Results and Discussion

Physical Parameters:
1.Temperature:
During the first year of analysis Temperature of yaldari dam is recorded 18.25 °C ± 1.7078 to 29.75 °C ± 0.500 in 2019. Highest value of temperature was recorded in the month of Jun while the lowest was recorded in the month of December. There was not very significant difference in water temperature in the all sampling sites. The water temperature is important factor for indicating the quality of water. It affects the aquatic organism, chemical solutes and dissolved oxygen and carbon dioxide in water.

2.pH:
The water quality is also determine by pH of water sample. During study periods the pH value is ranges from 7.23 ± 0.1708 to 8.1±0.1215. the water quality of yaldari dam is near about neutral. The highest pH was

recorded in the month of April and Jun while lowest was observed in November and December.

3.Conductivity:

Conductivity is an important parameter to know the quality of water. The mean values of conductivity ranged between 215 ± 7.746 μmho/cm to 377.50 ± 22.883 mho/cm. The conductivity shows lower value in December in both year and shows higher in February in 2019.

Conductivity was lower in winter season was reported by Singh *et al*., (2012). Certain controversial reports are found that the conductivity was higher in winter, the highest value of conductivity might be due heavy load from all side into lake. (Koshy and Nayar, 2000; Karadkhede, 2008). All water body of Morna reservoir is maximum covered with the field area therefore organic matter influence the water conductivity, in rainy season

organic soil are artificially drained, it increases the cation concentration of ponds.

4.Turbidity:

Turbidity of water was found 5.20±0.5142 to 9.14± 0.153 NTU in the first year period January to December 2019 Maximum turbidity observed in the month of June and all over the monsoon and minimum in December.

In Monsoon season turbidity is increases due to rain water flow in the reservoir from all sides, similar result obtained by Agarwal and Rajwar (2010), according to them increased turbidity in monsoon month attributed to soil erosion in nearby catchment also suspended solids. Clay, organic matter, planktons slit and other microscopic organisms are increases turbidity of water. Turbidity was found different i.e. maximum turbidity found in month of February, due to human activity and decrease in water level reported by Manjare *et al*., (2010).

Table No. 1: Physico-Chemical Parameters of Yaldari Dam, Parbhani.

Parameters	Mean of Highest Value during Study Periods	Mean of Lowest Values during Study Periods
Temperature ^{0}C	29.75 ± 0.5	18.25± 1.7078
pH	8.1± 0.1215	7.23± 0.1708
Turbidity NTU	9.14± 0.1533	5.2± 0.5142
TDS mg/l	375.36± 36.155	231.37± 12.6415
EC μmho/cm	377.5± 14.4338	215± 7.746
DO mg/l	7.70± 2.2494	4.75± 0.4123
CO2 mg/l	7.7± 2.2494	4.45± 0.4203
CO3 mg/l	56.5± 23.445	23.75± 6.3443
HCO3 mg/l	139.25± 18.4639	98.13± 1.652
Total Hardness mg/l	300.5± 58.66	141.5± 19.8074
Calcium Hardness mg/l	43.4± 8.7741	8.3± 0.4999
Magnesium Hardness mg/l	63.34± 12.3281	25.82± 4.872
Chloride mg/l	140.73± 3.3382	68.43± 6.261
Salinity mg/l	254.05± 6.0255	123.54± 11.3012
Phosphate mg/l	2.11± 0.4426	0.17± 0.0506
Ammonia mg/l	0.78± 0.5258	0.03± 0.0472
Nitrite mg/l	0.48575± 0.41435	0.01± 0.0096
Nitrate mg/l	8.32± 0.6357	2.16± 0.1415
Sulphate mg/l	7.375± 2.519755	3.55± 0.5260
Silicates mg/l	8.65± 2.1044	1.60± 0.6801
BOD mg/l	2.13± 0.45	0.47± 0.1544
COD mg/l	15.48± 3.3856	9.35± 1.0777

5.Total Dissolved Solids:

Total dissolved solids is used to measure amount of particles that dissolved in water, that is nitrates, calcium, magnesium, sodium, potassium, iron, carbonates and bicarbonate.

TDS in year 2019 ranged from 228.83 ± 28.798 to 375.36 ± 36.155 mg/L. Total dissolved solids were found to be maximum in the month of June, July and minimum in April. Due to agricultural land near the dam, runoff is rich and it increases the fertilizers, organic matter and salts in aquatic water, therefore the 391 mg/L TDS is found in June, similar result obtained by Makode (2012) of Charghad dam Amravati, Maharashtra. Some controversial results obtained by Verma *et al.,* (2011), they found increased TDS in summer season and decreased in monsoon due to dilution of rain water.

Chemical Parameters
6.Dissolved Oxygen:

During the first year 2019 of investigation, mean values of dissolved oxygen was found 3.90± 0.3559 to 7.70 ± 2.2494 mg/L. Dissolved oxygen was found maximum in the month of December and January and minimum in September, October. Similar results were recorded by Khan *et al.* (2012). Dissolved oxygen is play vital role in aquatic fauna, it is an important parameter for aquatic life mainly fish culture, it found lower in summer by (Rani *et al.,* 2004 and Medudhula *et al.,* 2012).

7.Carbon dioxide:

CO2 is found in three forms i.e. freeCO2, CO3, or HCO3 depends upon the pH and biological condition .The Carbon dioxide found 3.9 ± 0.3559 to 7.7 ± 2.2494 mg/L in 2019. It found maximum in monsoon and minimum in March month in both the study year but presence of free CO_2 is also depends upon the time of sampling and seasonal fluctuations in water body.

 The total CO_2 concentration in water depend upon pH Which is governed by the buffering effect of carbonic acid, carbonate and bicarbonate Hutchinson (1957). Free Co_2 was recorded negligible at Kagal tank, high at Kanerwadi and moderate at kandalgaon tank by (Pailwan *et al.*, 2008 ; Sharma *et al.,* 1978) also pointed

that, absence of free carbon dioxide in unpolluted water bodies.

CO_2 is essential for respiratory metabolism of phytoplankton and aquatic vegetation, increased carbon dioxide level might be due to uptake from autotroph, assimilation by algae and aerobic bacteria of decay add CO_2. (Sivakumar and Karuppasamy, 2008).

Alkality

The alkality to natural waters is mainly imparted by three prominent bases; Carbonate ($C0_3$), bicarbonates ($HC0_3$) and hydroxide (OH), therefore alkality estimated as individual base. According to Solanki and Pandit (2006) the alkality changes depends upon the carbonate and bicarbonate and also depend upon release of carbon dioxide.

8. CO3 (Carbonate Phenolphthalein alkality):

During the study period Carbonate was found 22± 2.8284 mg/L to 56 ± 23.44 mg// in 2019. Carbonate value increases in summer and minimized in monsoon season.

9.HCO3 (Bicarbonate or Methyl Orange alkality):

Annual changes found in bicarbonate value are ranged from 98.13± 1.652 mg/L to 139.25 ± 18.464 mg/L in 2019. Bicarbonate value found to be minimum in June month and maximum bicarbonate alkality found in March.

The total value of carbonate and bicarbonate increases in summer and decreases in the month of monsoon it may due to dilution water in rainy season and in summer less water increases the percentage of alkality in water body. The controversial results obtained by Verma *et al.,* (2011) they found maximum value of alkality in monsoon and minimum during summer.

10.Total Hardness:

Total hardness of water was found 141.5± 19.807 to 300.50 ± 58.660mg/L in 2019. The maximum hardness of the dam water increases in February month in both the years and minimum hardness found in winter season during study period.

The total harness was recorded higher in summer, it might be due to decrease in water level and rate of evaporation of water .similar result observed by (Hujare ,2008; Manjare *et al.,* 2010). Total hardness of water increases mainly due to the presence of (Ca^{2+}) and magnesium (Mg^{2+}) ions in every water body which may increases due the human washing clothes, bathing activities in dam.

11.Calcium Hardness:

Calcium is major cation found in water. During first year of study period calcium Hardness found 8.30 ± 0.4999 to 43.40± 8.7741 mg/L. The maximum Calcium hardness found in January month and minimum in Monsoon in both the years. The maximum desirable limit of calcium in drinking water is 75mg/l (W.H.O), therefore above recorded value of calcium, it indicate water is use for drinking purpose. Maximum value of calcium in winter season, controversial result obtained by Harney *et al.,* (2013) recorded calcium hardness minimum in winter season. Ravikumar *et al.,* (2005) reported the maximum calcium hardness in April month in Ayyanakere tank in Harapanahalli town in Davangere district of Karnataka.

12.Magnesium Hardness:

Magnesium Hardness was calculated from removing calcium hardness from total hardness. The magnesium hardness found in this reservoir was 25.82 ± 4.8272 mg/L to 63.34 ± 12.3281mg/L in the year 2019. Which not show much more significant differences during study period. Maximum hardness of magnesium was found in the month of February and minimum in winter season of both the year of study period. Similar result found by (Patil 2014). The permissible limit of magnesium of drinking water is 50mg/l (W.H.O) but our result about magnesium was above 66mg/l, so it may hazarders for drinking purpose.

13.Chloride:

The chloride value of Yeldari dam was ranged from 68.43± 6.2610 mg/L to 140.73 ± 3.338mg/l in 2019. The chloride value was higher in summer and minimum during winter season in both the year of study period. Similar result obtained by Shinde *et al*., (2011), according

to them Higher level of chlorides in natural water is indication of pollution and domestic sewage. Likewise in dam there may be certain anthropogenic activities increases chloride concentration in water. The result obtained by Pulugandi (2014) that chlorides were minimum at winter and shows maximum in monsoon season.

14.Salinity:

Salinity can also calculated from the chloride, during study periods the mean salinity were found 123.54±11.301mg/l to 245.05± 6.0255 during 2019. The highest salinity value was recorded in the month of May while lowest was recorded in the month of February during both years. Siddqi 2008 studied salinity ranges from 28000-60000mg/l, the low temperature of the water may also higher amount of inorganic salts dissolved in it, which responsible for high level of salinity observed in the lake water or dam water.

15.Phosphate :

As the dam is totally surrounded from all sides by field area and totally water in dam is used for irrigation purpose, therefore it also necessary to study the phosphate level in water.

The phosphate level during the first year of study was found 0.17 ± 0.0506 to 2.11 ± 0.4426 mg/l in 2019 . The phosphate level was higher in Monsoon season and lower in summer and winter season. Similar result obtained by (Arvindkumar 1995; Manjare, 2010 and Makode, 2012) that the maximum value of phosphate recoded in August and minimum in October i.e.in winter season. Due to surface water runoff, agriculture run off, washer man activities increases inorganic phosphate in water in rainy season therefore phosphate level increases in monsoon season.

16.Sulphate:

The mean Sulphates from the all four sampling sites during 2019 were 3.55 ± 0.5260mg/l to 7.375 ± 2.51976 mg/l. The highest was observed in the month of November and lowest was in the month of February. On sampling site S4 Sulphates values was increases due to which residential area of water supply colony on the bank of Dam water. Similar results obtained by Borul

(2012), Satyanarayan *et. al.,* (2008) observed sulphates values in the range of 20 to 26.4 mg/L. Pawar (2010) observed Sulphates was 22 mg/L in pre-monsoon and monsoon season and 21 mg/L in post-monsoon season.

17.Silicates

During the first year of study period silicate value were ranges between 1.60±0.6801 mg/l to 8.65 ± 2.1044 mg/l in 2019. The lowest value of silicates was observed in both years the month of January and highest was observed in September. Contents of silicates may have triggered the overwhelming growth of *Bacillariophyceae*. Silicate contents of the dam or lake were recorded vary low from August silicates gradually increase during post-monsoon months and reach at its maximum during summer months by Dabhade (2006, 2013). Silicates is known to regulate availability and abundance and dominance of Diatoms in many aquatic environments, it has been recognized as determinant of algal community structure of the lake Siddiqi (2008).

18.Ammonia

In the lake or Dam water Ammonia observed due to the died and decomposition of organic matter or it may due to the excretory product from Ammonotelic organism. During the first year of investigation mean Ammonia was 0.03 ± 0.0472 mg/l to 0.78± 0.5258 mg/l in 2019.T he lowest was value observed during the month of March in both years and highest in the month of the May . The trace amount of ammonia were detected is due to the evaporation of the ammonia at higher temperature like the month of May and Jun hence the values of ammonia was under the trace amount. Ammonia was observed high as well as low in the both years of sampling all sites during summer it was observed high and in the winter was low. Then also as compared to both years value of ammonia was observed vary slightly unchanged. High amounts of ammonia and ammonical toxic compounds are produced during decomposition of the algae. Toxicity of these compounds kills the organisms Dabhade (2006). During the decomposition lot off ammonia produce along with low dissolved oxygen. Dabhade (2013) observed ammonia in lake

water was 11.46mg/L. Ammonia is the product of organic decomposition Siddiqi (2008).

19.Nitrite

During the first year of study periods mean Nitrite was 0.01 ± 0.0096 mg/l to 0.4858 ±0.41435 mg/l. Nitrite value were observed trace amount similer results also observed by Shinde *et al.,* (2011), then also the highest was observed in the December and Lowest was in February 2019. The values are not accepted due to observing trace amount of nitrite. The value slightly changes during investigation of water sample.

20.Nitrate

Nitrates is highly oxidized form of nitrogen, in natural water due to runoff fertilizers, decayed vegetable and domestic waste are increases the amount of nitrogen in water.

Nitrate value ranged from 2.16 ± 0.1415 to 8.32 ± 0.6357 mg/l in 2019. The nitrates value was higher in monsoon season and recorded lower in late winter and summer season. The controversial result obtained by Dabhade (2006) i.e. high values of nitrates observed in winter season and gradually increased in summer season. Nitrates is act as nutrient for growth of plants, excess amount of nitrogen helps for rapid growth of algae and other plants in water,

Nitrates is found very small amount in nature because ongoing process of growth and decaying. Most stable form of nitrogen is nitrates which enhances the growth of plankton density and primary production. Parida *et al*., (1999).

21.BOD (Biological Oxygen Demand)

BOD (Biological Oxygen Demand) is very important parameter of water, because on that basis we determine the status of planktons population present in to it. The BOD values were high due to the contribution of nitrates and phosphates present in the lake or Dam water Dabhade (2013). So the BOD was estimated monthly by taking the water sample form the Dam and analyzed in to the laboratory. During the study periods

mean BOD was observed during the 2019 it was 0.35 ± 0.2265 mg/l to 2.13 ±0.45 mg/l. The highest value of BOD were observed in the month of February and lowest was observed in month of Jun in 2019. Such fluctuation of BOD is due to the Planktonic population that means zooplanktons population. BOD in summer was high as compared to winter. Dabhade (2013) The low rate of primary production in aquatic ecosystem of lake is also indicates that the low value of BOD that ranged from 0.1 to 0.9mg/L by Borul (2012). Verma *et. al.,* (2011) observed BOD ranges from 38-40 mg l^{-1} showing that the lake water is organically polluted. BOD was observed in the range of 48-96mg/l by Satynarayan *et. al.,* (2008). Shinde *et, al.,* (2011) observed high value of BOD in the lake water which was in the range of 1380 to 1864.

22.COD (Chemical Oxygen Demand)

Chemical Oxygen Demand throughout the study periods 2019 was 9.35 ± 1.0777 mg/l to 15.48 ± 3.3856 mg/l. The lowest COD value was observed during the rainy season while the chemical oxygen demand increases from the winter to summer season. Highest demand was investigated in the month of December while lowest was started from the month of January. On sampling site S4 the value of COD was more during the whole study periods. Verma *et. al.,* (2011) observed COD ranges from 350-405 mg l^{-1} showing that the lake water is organically polluted. Borul (2012) observed COD ranges from 0.01 to 0.06mg/L. Satynarayan *et. al.,* (2008) observed highest COD value was 392mg/L. while lowest 276mg/L the COD and BOD ratio ranged between 75 and 10.66 indicating presence of biologically recalcitrant substances of organic nature. Shinde *et. al.,* (2013) observed COD in the range of 620 to 3168.

4. Conclusion

On the Basis of result obtained during study periods, it concluded that the dam water safe enough to be consumed by humans or used with low risk of immediate or long term harm. After physicochemical analysis we found that the Dam water from all four sampling sides is use for Drinking as well as Agriculture point of view is free from pollution and ecologically balanced.

Conflict of interest

No conflict of interest influenced in this research.

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