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Physico-Chemical Study of Gopi Krishna Sagar Dam (Ruthiyai), Guna Madhya Pradesh

Mallavika Bhagat, Manju Sharma

Research Scholar, Life Science Department, Career Point University, Kota, Rajasthan, India
Guide, Life Science Department, Career Point University, Kota, Rajasthan, India

ABSTRACT: Fresh water is an essential natural resource for living. Dams have been used for thousands of years to regulate river flow and ensure water needs for human use. Reservoirs created by dams not only controls flood but also provide water for several human activity likes human consumption, irrigation, industrialization, aquaculture, recreation, power generation etc. In the present study, attempts were made to study, analyse and estimate the current status of physicochemical characteristic of the Gopi Krishna Sagar Dam, situated in Guna, District Madhya Pradesh. The study was carried out from the month of October 2018 to September 2019 as per following seasons: i.e. post monsoon, monsoon, summer and winter. Water sample were collected from three stations of the Dam. Temperature and pH were studied on the spot and the remaining were analysed in laboratory. Parameters like Biological Oxygen Demand (BOD), Total Alkalinity (TA), Turbidity, Dissolve Oxygen(DO), Total Hardness(TA), Total dissolve solids(TDS), Chloride and Fluoride were studied. The study reveals the seasonal variation in physicochemical parameters was observed during the entire study period.

KEY WORDS: Dam, pH, Biological Oxygen Demand (BOD), Total Alkalinity (TA), Turbidity, Dissolve Oxygen (DO), Total Hardness (TA), Total dissolve solids (TDS), Chloride and Fluoride.

I. INTRODUCTION

Water is an indispensable natural resource on earth. All kind of life including human beings depends on water for various purposes (Mullar et al., 2010). It is essential for all vital process. Aquatic ecosystem is highly dependent on water quality and biological diversity. The quality of water of any ecosystem provides information of all the resources available for supporting life in that ecosystem. The water quality depends on its physico-chemical parameters, any change in physico-chemical characteristic has direct effect the aquatic biodiversity (Bhalerao 2013). Now a day's water is going to be polluted day by day with increasing urbanization. Monitoring these parameters helps to know the source and magnitude of pollution load and its stress on the aquatic life, especially fish fauna. Present study is conducted Gopi Krishna Sagar Dam is situated near Ruthiyai Village in between 24.5478°N and 77.2320°E latitude and longitude in Guna District, Madhya Pradesh. It is an earthen dam, constructed on river Chopat. Water in this dam is used for drinking purpose, irrigation and aquaculture.
The objective of the study is too revealed out the quality of dam water in terms of physico- chemical characteristics in relation with fish biodiversity. The study is carried for a period of one year from October 2018 to September 2019

II. SIGNIFICANCE OF THE SYSTEM

The paper mainly focuses on the various physico-chemical study of water of Gopi Krishna Dam. The study of literature survey is presented in Section III, methods in section IV, section V gives the experimental results and discussion and section VI contains conclusion.

III. LITERATURE SURVEY

In past years a lot of work was done in the field of hydro biology and the characterisation of their physico chemical parameters. Noble contribution in assessing physico-chemical parameters of different freshwater bodies in India have

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been made by several research workers like (Murthuzasab et al., 2010), (Choudhary et al., 2010), (Hussain et al, 2012), (Kevat et al., 2016), (Totwar and Tamlurkar, 2017), (Gautam and Sharma 2018) etc.

IV. MATERIAL METHOD

Study area-
Gopi Krishna Sagar Dam is situated near Ruthiyai Village in between 24.5478° N and 77.2320° E latitude and longitude in Guna District, Madhya Pradesh. It is an earthen dam, constructed on river Chopat. The study was undertaken during the month of October 2018 to November 2019 to assess the quality of water. Three stations were selected
Station S1-Panj
Station S2- Dhay
Station S3- Bajrangarh

Collection of water samples-
The sampling stations were visited every month between 7AM to 11AM. On each sampling day water samples were collected in two DO bottles (300 ml capacity) and one large PVC bottle (two litre capacity). The temperature and pH were noted on the spot and remaining physico- chemical analyses were done in laboratory.

Analysis of physico-chemical factors-
Average values of physico chemical parameters of Gopi Krishna Sagar Dam water from October 2018 to September 2019 were determined using Standard methods (APHA, 1998).
Glass mercury thermometer and pH meter were respectively used to note temperature and pH on the spot.
Other parameters as dissolved oxygen (by Azide modification method), DO. BOD and total alkalinity (by titrimetric method), total hardness (by EDTA titrimetric method), total dissolve solid (by gravimetric method), turbidity (by Nephetometer), chlorine (by photo meter) and fluorine by SPADNS method (by using spectrophotometer at 570nm) were estimated and compared with standard values

V. RESULT AND DISCUSSION

Temperature- Water temperature is one of the main factor affect the physiological factors and biological activities of aquatic ecosystem. Cold water slows down the metabolic rate and warm water increases the metabolic rate of fishes. The temperature of reservoir is range from 18.1 to 39.5 in different seasons. Maximum temperature was noticed in the month of June due to exposer of surface water to solar radiation, while minimum temperature was recorded in January.

Hydrogen concentration (pH)- pH scale is used to measure the concentration of H+ ions in water. It is an important variable in quality assessment. Changes in pH indicates the presence of various effluent Water having the pH range of 6.5 to 9.0 are more suitable for development of pond culture(Swingle 1967). Long term expose for fishes beyond this limit slows fish growth and effect their health. In our study pH ranges between 7.1 in month of July to 8.6 in month of May.

Turbidity-Turbidity is inversely proportional to transparency. Water turbidity can result from planktons, organic matter, clay, slit and other microscopic organism. BIS desirable value of turbidity is 5 NTU. Increase in turbidity shows negative effect on aquatic organism, it can cause clogging of gills or injuries to different tissues (Tessema et al., 2014). High turbid water is also harmful to human consumption due to the presence of pathogenic micro-organism (Bodone 2015). Reservoir ranges minimum 1.0 turbidity at Station1 and 2 and maximum 11.7at station 3.

Total Hardness (TH)-Total hardness of water represents primarily the total concentration of calcium and magnesium ions expressed as calcium carbonate. BIS has prescribed desirable limit of total hardness is 300mg/l. The maximum total hardness was recorded as 220 at station3 in month of May while minimum is recorded as 80 at Station1 in month of July. Increase of total hardness in summer season may be due to decrease in water volume and increase of carbonates and bicarbonates. Results of studies were within the permissible limits as prescribed by BIS.

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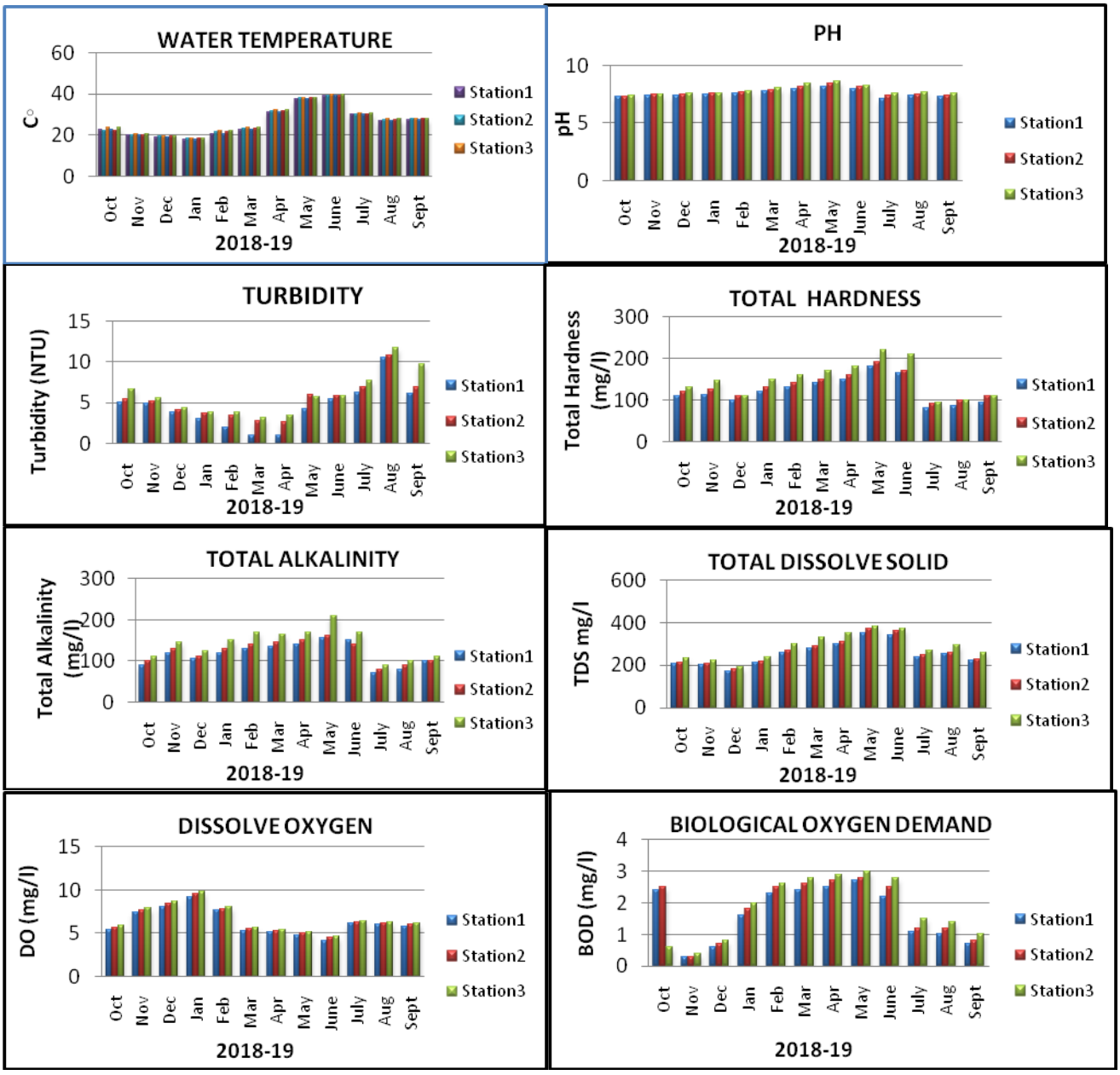
Total Alkalinity-Alkalinity of water is the capacity to neutralize strong acids. Alkaline water of reservoir is good for fish growth and production. BIS has set a desirable level of alkalinity in drinking water to be 200 ppm. It fluctuated according to pollution load**.** Results show total alkalinity ranges from 70 ppm to 210ppm. Maximum alkalinity observed in June due to increase in bicarbonate in water.

Total dissolve solid (TDS)-TDS are the inorganic matters and small amounts of organic matter, which are present as solution in water. Excess amount of TDS comes from industrial waste, agriculture medium, sewage, minerals and bicarbonate cause delayed in growth of fishes in certain life stages especially during fertilization and increases their mortality rate (Weber-Scannell and Duffy 2007). Result shows TDS level is 170mg/l in winter season and 385mg/l i n summer season.



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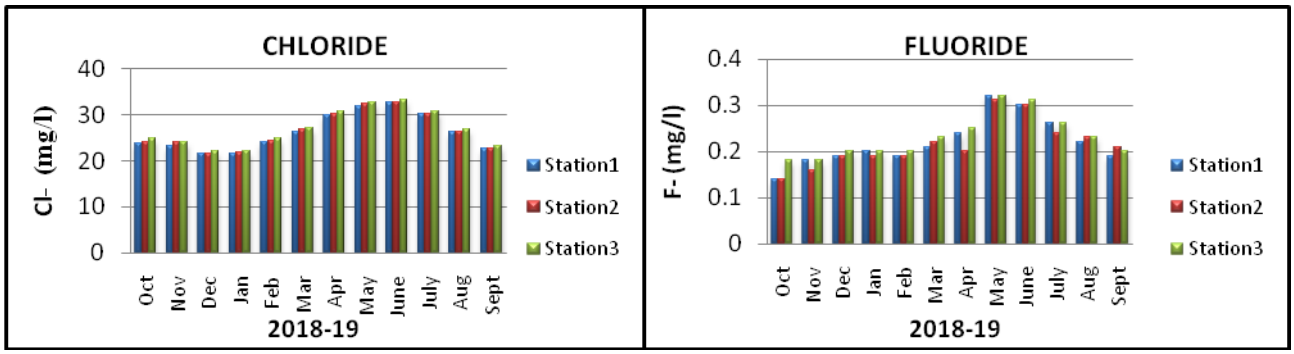

Fig1.1Results of Physico-Chemical characteristics of Gopi Krishna Sagar Dam (2018-19)

Dissolve oxygen (DO)-DO is essential to maintain the higher form of biological life in water. It was observed that DO was higher in open water bodies while less in deep water. The optimum value of good water quality is 4 to6mg/l of DO which indicates the healthy life of aquatic organism (Basavaraja et al., 2014). Present study reveals that the reservoir ranges DO level in between 4.1 to 9.8. Do level was found maximum in winter and minimum in summer season, decline of DO in summer season may be due to high metabolic rate of organism.

Biological oxygen demand (BOD)- BOD is the amount of oxygen utilized by micro-organism to stabilize the organic material. It is an indicator of organic load in water bodies. Higher value of BOD is found in highly polluted water. In the present investigation BOD ranges from 0.3 to 3.0. Higher concentration is seen at station 3,may be due to discharge of agriculture and domestic waste

Chloride-Chloride occurs in all natural water bodies in various concentrations. Higher concentration of chloride may be due to the discharge of sewage and excess chloride. It serves as the indicator of water pollution (Mullar et al., 2010**).** Present investigation shows chloride concentration range from 21.42 to 33.12. Lower concentration is seen in winter while higher concentration of chloride is seen in summer season which is may be due to higher rate of evaporation.

Fluoride-It is one of the critical chemical parameters which influence the quality of dam water. WHO and BIS has been decided fluoride concentration up 1- 1.5 mg/L**.** Excess intake of fluoride in drinking water cause fluorosis in human being and it accumulate in the bone tissue of fishes. Fluoride ions also act as enzymatic poisons, interrupting the metabolic process in fishes (Camargo 2003).Our results show fluoride concentration in all seasons between 0.14 mg/L to 0.32 mg/L.

VI. CONCLUSION

Present study shows detailed physico- chemical characteristics and quality of Gopi Krishna Sagar Dam.It is observed that the post monsoon, monsoon, summer and winter season shows different seasonal fluctuations in various physico-chemical parameters. The results showed that parameters monitoring was satisfactory but some parameters showed slightly higher range in summer and rainy season due to excessive evaporation and increasing of suspended particles. Although water of the dam is safe for human uses and aquatic life. The water of the Dam is alkaline in nature which is suitable for aquaculture and all the others parameters are also in limits favours for fish cultivation and allows for high ichthyo faunal diversity.

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