International Journal of Applied and Universal Research **E- ISSN No: 2395-0269**
Volume V, Issue III, October 2018 Available online at: www.ijaur.com

PHYSICO-CHEMICAL STUDY OF BAKIYA BARRAGE DAM SATNA (M.P.)

Kiran Singh[1] and Dr. Suman Singh[2]
1. Research Scholar Department of Zoology Govt. Model Science College Rewa (M.P)
2. Prof. of Zoology Govt. Model Science College Rewa (M.P)

ABSTRACT: In the present study is going to centralize on Tons Bakiya Barrage Dam of Satna district in central India. The Tons Barrage Dam is situated in village Bakiya tiwariyan village, tehsil- kotar, district Satna (M.P.) and lies at latitude of $24^0$42'04"N and longitude of $81^0$09'15"S.The catchment area of Tons Barrage dam in 4457sq.km. and gross Capacity in the. 35427cum., height of the Dam in 20.5m.and length of Dam in 4855m. The Dam water use is domestic purposes, irrigation, aquaculture etc. The surrounding area of dam semi urban semi agricultural and to generate electricity. Present study is aimed at investigating the main factors responsible for water pollution in Bakiya barrage at Satna (M.P). The inevitable proximity of a city/town to dam would introduce the controllable and in-controllable types of pollution sources. The controllable sources include the water carriage system of sewers and industrial waste water. An extensive research work has been reported on the effects of the municipal waste water effluents on the water quality, fish population and bottom fauna characteristics of receiving dam. Study on hydrological status of Bakiya barrage water was made to assess the portability of water from 2017. Some physico-chemical parameters were considered such as surface water temperature, turbidity, pH, dissolved oxygen, hardness, alkalinity, phosphate and nitrate contents. Among the in this study, diversity, and evenness and to predict the state of Bakiya barrage according to physico-chemical parameters.

KEYWORDS:- Physico-chemical parameters, Seasonal variation, Bakiya barrage.

INTRODUCTION

Water is one of most important constituents of life support system. It is indeed a wonderful chemical medium which has unique properties of dissolving and carrying in suspension a huge varieties of chemicals. Thus it can get contaminated easily. Natural surface water bodies often have impurities from various sources. The impurities may be suspended particles, colloidal materials and may also be dissolved cationic and anionic substances. Various kind of natural and man-made activities, like industrial, domestic, agricultural and others, day by day creating water pollution challenges with new protections to give all our children the gift of clean and safe water in the 21st century.

Fresh water is a critical, finite, vulnerable, renewable natural resource on the earth, and plays an important role in our living environment, without it, life is impossible. Since the beginning of the industrial revolution, increasing human population, economic activities as well as short comings in their management have resulted in more pollutants being introduced into watercourses. An increasing number of surface water bodies have come under serious threat of degradation. The global freshwater resources are under increasing pressure (GWP Technical Advisory Committee, 2000).

During the study of earth watch program, the ecologists and hydro-biologist have observed that there are several natural and man engineered resources, which are still lacking of research studies therefore a gap have been formed (Williams & Feltmate,1992). The importance of fresh water bodies for human habitation is well known. Man's greed for luxury and comforts has resulted in rapid deterioration of environment. The water bodies from the immemorial had an aesthetic look, quenching the thirst of millions of people have today been loaded with toxic materials and chemical which have rendered them almost useless.

A study of fresh water habitat with special reference to its Physico-chemical and biological characteristics is termed as limnology. However, Wetzel (1975) defined the term limnology as "The study of functional relationship and productivity of fresh water biotic environment parameters". Among the pioneers in the field of limnology, the earliest known work is that of F.A. Forel (1841-1912), who was not only studied Geneva lake in Switzerland but also published a book

"Handbuch der seen kunde: Allgemlinelimnologic" in 1901. In this book the term limnologic was used for the first time by him. Since then the term has gained a lot of currency and at present the limnology has become an important field in the Scientific investigations.

Dams interrupt stream flow and generate hydrological changes along the integrated continuum of river ecosystems (Vannote et al., 1980) that ultimately can be reflected in their associated fisheries. The most obvious effects of placing dams on rivers result from formation of new lentic or semi-lentic environments upstream from the dam and tail water environments downstream from the dam. Both environments can be conducive to the establishment and maintenance of fish stocks for exploitation by fisheries. Natural streams supported fish communities of high species diversity which were seasonally more stable than the lower-diversity communities of modified streams Joshi et.al (2014). The disturbances such as channelization, seasonal peaks in species diversity attain levels typical of undisturbed streams. Because seasonal changes in stream quality are high, the stability of the fish community is lower in modified than in natural streams. India's Rivers, riverine biodiversity and river dependent communities are facing major threat: from large dams and other developmental activities (Das 2008). India has possibly the biggest number of large dams under construction. Over 10.8 Million people depend on riverine fisheries which are degrading and collapsing at an alarming rate. Large dams are planned and are under construction in and around and are affecting ecology (Januchowski et.al 2013). Indigenous People are being hugely impacted by these. Nonetheless, dams are being permitted disregarding community concerns and ecology.

The present study was made on water quality and occurrence of some respect to physico-chemical parameters in Bakiya barrage Satna (M.P.).

MATERIAL AND METHODS:-

The quality of Bakiya dam water is deteriorated because of in-stream uses of water in the following ways. During survey it was observed that rural areas are situated on both the side of Satna, which are engaged mainly in the agriculture and cattle farming. These cattle's while wading in the river transfer fecal matter and other types of pathogens in the dam. Also the vigorous movement and activities of the cattle inside the water disturb the river bed where the pollutants are settled in the form of sludge. This ultimately deteriorates the quality of the dam water to a considerable extent. The present study conducted from 2017.

Water samples were collected monthly in the morning at 8 am to 10 am from surface layer of the dam. Physico-chemical analysis of water samples were made following standard methods suggested by APHA, AWWA, WPCI (2005).

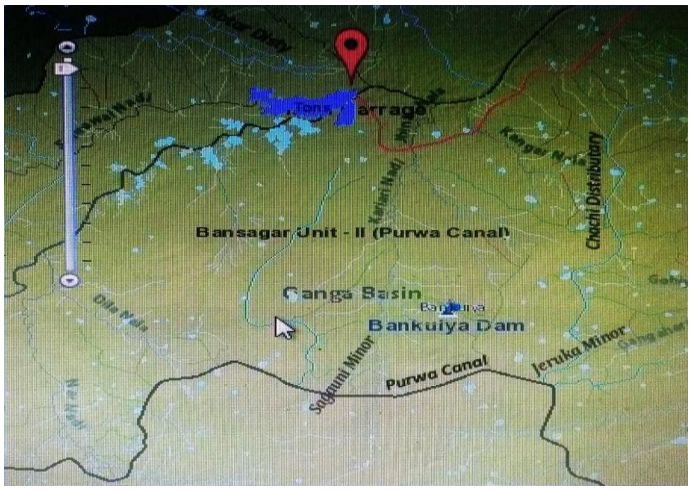

Fig. 1 Satelite Map of Bakiya Dam Satna (M.P.)

RESULT AND DISCUSSION:-

The data on physico-chemical analysis of Bakiya barrage has been given in table no. 1

Water temperature (^{0}C):-

Water temperature is important as it regulate aquatic life of water bodies. Temperature fluctuations are evident both in diurnal and seasonal pattern in aquatic ecosystem. During the presents study period water temperature ranged from 19.6 ± 4.5 0C to 33.7± 7.20 0C Jayabhaye et. al; (2006), Salve and Hiware (2006), observed that during summer, water temperature was high due to low water level and clear atmosphere. Similar results were obtained in the present study.

Turbidity (NTU):-

Turbidity of water is actually the expression of optical property in which light is scattered by the particles present in the water. The turbidity values ranges from 38 ± 8.51 to 80 ± 7.38 NTU. The maximum value was

recorded from rainy season and minimum in the winter season.

pH:-
The pH expresses the intensity of acidity or alkalinity of an aqueous solution. Generally in India many small confined water pockets particularly, are alkaline in nature. The pH values ranges from 7.55 ± 0.45 to 8.0 ± 0.27. The maximum value was recorded from Summer and Minimum in the rainy season. pH was alkaline throughout study period.

T.S. (mg/l):-
Total solid are residue that includes both dissolved solids and suspended solids in water. The total solid value ranges from 427 ± 4.77 to 432 ± 5.76 mg/l. The maximum value was recorded from summer season and minimum in the summer season.

T.D.S. (mg/l):-
Total dissolved solids denote mainly the various kinds of minerals present in water. T.D.S. does not contain any gas and colloids. The total dissolve solid value ranges from 320 ± 14.64 to 368 ± 0.40 mg/l. The maximum value was recorded from summer season and minimum in the rainy season.

T.S.S. (mg/l):-
The total suspended solid value ranges from 62 ± 8.49 to 107 ± 13.80mg/l. The maximum value was recorded from rainy season and minimum in the winter season.

Hardness (mg/l):-
Hardness of water is not specific constituent but as a variable and complex mixture of cations and anions. Hardness of the natural water is mainly caused by cations such as calcium and magnesium. The value of hardness fluctuates from 220 ± 5.20 to 228 ± 5.77 mg/l. The maximum value was recorded in the month of summer and minimum in the month of winter.

Alkalinity (mg/l):-
The capacity of water to neutralize a strong acid is known as alkalinity and is characterized by the presence of hydrogen ions; most of the alkalinity present in water is due to dissolution of carbonates. Total alkalinity ranges from 132 ± 8.17 to 201 ± 4.78 mg/l. The maximum value was recorded in winter season and minimum value in the rainy season.

Phosphate (mg/l):-
The increased application of fertilizers, use of detergent and domestic sewage greatly contribute to heavy loading of phosphorus in the water body. The value of phosphate ranged from 0.33 ± 0.05 to 0.36 ± 0.06 mg/l. The maximum value was recorded in the summer season and minimum values in the rainy. The high values of phosphate in monsoon are mainly due to rain, surface run-off, agricultural run-off; washing activities that contributed to the inorganic phosphate content. Similar results were reported by Arvind Kumar ((1995).

Nitrate (mg/l):-
Nitrate is the end product of aerobic degradation of organic nitrogen and its occurs very commonly in polluted water. The value of nitrate ranges from 0.19 ± 0.03 to 0.31 ± 0.14 mg/l. The maximum value was recorded in the summer season and minimum in the winter season. Swaranlatha and Narsingrao (1998) reported that nitrates are in low concentration in summer and high during monsoon which might be due to surface run-off and rain. Similar results were obtained in the present study.

Dissolved Oxygen (mg/l):-
Dissolved oxygen is essential to aquatic life and play an important role in biogeochemical processes in fresh water environment. The value of DO fluctuate from 6.60 ± 0.24 to 7.42 ± 0.39 mg/l. The maximum values were recorded in the month of winter and minimum value in the rainy season. The high DO in summer is attributed to increase in temperature and duration of bright sunlight. The long days and intense sunlight during summer seems to accelerate photosynthesis by phytoplankton's, utilizing CO_2 and giving off oxygen. This accounts for the greater quality of O_2 recorded during summer. The quantity is slightly less during winter as reported by Masood Ahmed and Krishnamurthy (1990).

C.O.D. (mg/l):-
COD is a parameter used to measure the amount of organic compounds present in any water body. Chemical oxygen demand (COD) value range between 35.00 ± 1.15 and 38.00 ± 4.57 mg/l. The maximum values were recorded in the month of rainy and minimum value in the

summer season.There was no statistical difference in COD between the one year of study. APHA (1995), however, recommended COD levels of <2 mg/L in drinking water. High COD has been linked with pollution (Tepe et al., 2005).

B.O.D. (mg/l):-

BOD is another key indicator parameter in assessing degree of pollution. Biological oxygen demand (BOD) value range between 5.45 ± 0.15 and 5.82 ± 0.43 mg/l. The maximum values were recorded in the month of rainy and minimum value in the summer season). These findings are also in accordance with Ahmad (1989), Parashshar et al (2008), Sharma and Capoor (2010) and Arya et al (2011). The heavy human settlements around the pond are responsible for adding municipal waste water thus creating organic pollution in the pond. It is also an important factor in enhancing the BOD value Sharma and Gupta (2004).

Table No. 1- Seasonal Variation of Physico-chemical parameters of water of Bakiya Dam at Satna (M.P.)

PARAMETERS	Winter	Summer	Rainy
Temperature ºC	19.6 ± 4.59	33.7± 7.20	31.8 ± 2.56
Turbidity (NTU)	38 ± 8.51	42 ± 6.99	80 ± 7.38
pH	7.8± 0.25	8.0 ± 0.27	7.55 ± 0.45
T.S. (mg/l)	428 ± 4.79	432 ± 5.76	427 ± 4.77
T.D.S. (mg/l)	366 ± 6.46	368 ± 0.40	320 ± 14.64
T.S.S. (mg/l)	62 ± 8.49	64 ± 5.75	107 ± 13.80
Hardness (mg/l)	220 ± 5.20	228 ± 5.78	222 ± 5.79
Alkalinity (mg/l)	201 ± 4.78	162 ± 5.76	132 ± 8.17
Phosphate (mg/l)	0.34 ± 0.05	0.36 ± 0.02	0.33 ± 0.05
Nitrate (mg/l)	0.19 ± 0.03	0.31 ± 0.14	0.20 ± 0.03
D.O. (mg/l)	7.42 ± 0.39	7.10 ± 1.03	6.60 ± 0.24
B.O.D. (mg/l)	5.70 ± 0.86	5.45 ± 0.15	5.82 ± 0.43
C.O.D. (mg/l)	37.00 ± 2.06	35.00 ± 1.15	38.00 ± 4.57

CONCLUSION:-

Therefore it can be concluded through this study that the Bakiya dam with social and cultural importance is degrading at an alarming rate. In the past two decades the pond has shown drastic changes regarding the productivity. The rapid increase of human activities and assemblage of livestock, domestic swage, industries effluents are creating pollution in the dam water and needs immediate measure. At this critical time the local representatives, Government and Non- Government bodies, the educated bodies, the village heads and the reputed figures of the society should come forward and formulate conservational model for the sustainability of this beautiful natural water body.

REFERENCES:-

1. Adoni A.D. (1985)- A work book on limnology.
2. Ahmad, M. S.1989. Physiology of polluted ponds of Dharbhanga. Ph.D. thesis, L.N. Mithila University,Dharbhanga.
3. APHA (American Public Health Association) 1995. Standard methods for the examination of water and waste water. 19th edition. American Public Health Association Inc., New York, 1193 pp.
4. APHA, AWWA and WPCF (2005)- Standard methods for examination of water and wastewater. 20th Edition, American Public Health Association. Washington, DC.
5. Arvind Kumar (1995) – Some limnological aspects of the fresh water tropical wetland of Santhal Pargana (Bihar) India. J. Environ. And Poll., 2(3):137-141.
6. Arya, S, Kumar, V, Raikwar, M, Dhaka, A and Minakshi (2011) Physico-chemical Analysis of Selected Surface Water Samples of Laxmi Tal (Pond) in Jhansi City, UP, Bundelkhand Region, Central India Journal of Experimental Sciences 2(8): 01-06.
7. Bhargava, D.S. "Nature and the Ganga" *Envtal Conser*, 14 (4): p.307-18 (1987).
8. Brima, E.I. Physicochemical properties and the concentration of anions, major and trace elements in groundwater, treated drinking water and bottled drinking water in Najran area, *KSA Appl Water Sci*. 7:401–410. DOI: 10.1007/s13201-014-0255-x (2017).
9. Jayabhaye, U.M.; Pentewar, M.S. and Hiware C.J. (2006) – A study on physic-chemical parameters of minor reservoir, Sawana, Hingoli district, Maharashtra.
10. Khoshoo, T.N., Environmental Priorities in India and sustainable development, India Science Congress Association Publication, New Delhi: p. 3-48 (1986).
11. Masood Ahmed and Krishnamurthy R. (1990) – Hydrobiological studies of Wohar reservoir Aurangabad (Maharashtra state) India. J. Environ. Biol. 11(3),335-343.
12. Odum, E.P., "Fundamentals of Ecology" 3rd Edition, Saunders Co., Philapedia, : p. 61-67 (1977).
13. Parashar, C., N. Verma, S. Dixit and R. Shrivastava (2008) Multivariate analysis of drinking water quality parameters in Bhopal, India. Environ. Monit. Assess., 140, 119-122.
14. Parashar, C., N. Verma, S. Dixit and R. Shrivastava (2008) Multivariate analysis of drinking water quality parameters in Bhopal, India. Environ. Monit. Assess., 140, 119-122.
15. Sharma R and Capoor A (2010) Seasonal Variations in Physical, Chemical and Biological Parameters of Lake Water of Patna Bird Sanctuary in Relation to Fish Productivity World Applied Sciences Journal 8 (1): 129-132.
16. Tepe, Y., Turkmen, A., Mutlu, E. and Ates, A. 2005. Some physico-chemical characteristics of Yarselli Lake, Turkey. Turkish Journal of Fisheries and Aquatic Sciences, 5: 35-42.
17. Vinnote,R.L..Minshell,G.W.Cummiins,K.W.Sedell, J.R .and Cushing,C.E.(1980).The river continuous concept.Can.J. Fish.Aquat.Sci.37:130-137.
18. Wetzel, R.G. (1975) Limnology. W. B. Saunders Co., Philadelphia, U.S.A. pp. 743.
19. Williams and Feltmate (1992) and Mackie (1998) – Studies oculus artificial impound meals in U.S.A.
20. World Health Organization (WHO). 1971. International standards for drinking water. 3rd ed. Geneva. pp: 48-49.