International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133, Print ISSN: 2664-7125
Received: 06-10-2024, Accepted: 05-11-2024, Published: 20-11-2024
Volume 6, Issue 4, 2024, Page No. 52-55

Water Quality Status of Baur Reservoir Gularbhoj, U.S Nagar Uttarakhand (India)

Promod Joshi[1], Reeta Joshi[1], Nirmala Pargaien[2]
[1] Department of Zoology, S.S.J.D.W. Govt. P.G. College Ranikhet, Uttarakhand, India
[2] Department of Botany, M.B.P.G. College, Haldwani, Uttarakhand, India

Abstract
The current investigation was conducted between January 2022 and December of 2023. During the study period water quality was studied in Baur reservoirs two spot, one spot is a barrage area, and the second one is four kilometers away from the first one. The present study is done in Baur Reservoir, which is switched to Gularbhoj in Udham Singh district. Reservoir water is used for irrigation and domestic purposes. Many villages are located near the reservoir, so due to human interaction, water quality may be affected. For this reason, the present study finds parameters of water so we can identify the present water quality status, as we know many similar work done all over India but in this study we find present condition which may be change from past condition and as we know climatic condition are change now days so we can find rainfall in every month and other parameters of reservoir. Various quality parameters are measured, including P^H, water temperature, DO, CO_2, total alkalinity, total solid, turbidity, total suspended solids and total dissolved solids. All the parameters are within the permissible limit and suitable for domestic use, pisciculture, and agriculture. Water quality parameters have been observed to vary and, with the exception of temperature, all show a positive correlation with the production of phytoplankton and zooplankton in the chosen reservoirs. These parameters include temperature, pH, dissolved oxygen, carbon dioxide, and total dissolved solids. The temperature varies from $24^0c \pm 6^0c$, the pH varies from 7.0 $\pm$ 2, the dissolved oxygen range varies from 7$\pm$ 3, range of carbon dioxide varies from 6$\pm$ 5, the humidity range is 50$\pm$25, and rainfall throughout varying the all study period. All the physico-chemical parameters are the relation to plankton diversity. In this study, we also find plankton diversity status in Baur reservoir. All the water quality parameters are under safety level and are good for irrigation purposes and for domestic use. They can filtrate, and may relevant department may take action for tourist activity that causes pollution in reservoir water.

Keywords: Parameters, baur, pisciculture, water quality and turbidity

Introduction

Water is essential for life; we cannot expect life without it. Approximately 97% of the water on Earth is saltwater, while less than 3% is fresh water. The majority of the freshwater on Earth is frozen in ice caps, glaciers, or aquifers deep below the surface in the shape of lakes, ponds, rivers, and reservoirs. There are several different types of freshwater resources in India. Testing the water for physico-chemical properties is crucial before using it for home, industrial, agricultural, or drinking purposes. It is necessary to examine water using many physico-chemical characteristics [1, 2, 3]. Because they facilitate the growth of the industrial, agricultural, and urban sectors, provide electricity, and supply water for irrigation and human use, reservoirs are important for human societies on both a social and economic level. In Uttarakhand State, the experimental reservoirs constructed for irrigation during the post-independence era are a significant source of fish production [4, 5, 6]. Biological diversity and the physical-chemical characteristics of the water are critical to the upkeep of a healthy aquatic ecosystem. The biotic community structure, which includes species pattern, distribution, and diversity, reflects changes in the tropical conditions of the water and can be used to determine the effects of pollution on water quality. Primary and secondary production are directly correlated with the physico-chemical properties, specifically water temperature, pH, dissolved oxygen, clarity, and total dissolved solids [7, 8]. The primary uses of these reservoirs are for fishing, agriculture, and the production of hydroelectric power. [9, 10, 11]. The present study is about the physico-chemical and plankton diversity of the Baur reservoir. Baur reservoir is situated in Gularbhoj village in the Gadarpur Block of Udham Singh Nagar district and is fed by the Baur and Kakarata rivers. The total catchment of the reservoirs is 605 square kilometers. The water holding capacity of these reservoirs is 3650 million cubic feet. The total volume content of the dam (TCM) is 8252.Work on this reservoir began in year 1966-67. Its catchment area mainly comprises Tarai and Bhaber, which are spread over an area of 307.2km^2.The dam morphometry, comprises a length of 9.50km and a maximum height of 17.98meters, with a vast expanse of 1271.00 hectares. The reservoir receives an average annual precipitation of 1645mm, with normal monsoons accounting for 1500mm, which could sometimes go as low as 547mm (Uttarakhand irrigation department). The average water level in the reservoir from October to May is approximately 786.5ft. There are approximately nine villages located around the periphery of this reservoir. The dam is an irrigation dam, and its water irrigates the Tarai area of Uttarakhand.

Material and methods

The water samples have been collected from two selected sampling stations (spot1 and spot 2), where spot 1 is four kilometers away from spot 2. Monthly and seasonal samples have been collected from selected stations of the dam for two year, January 2022 to December 2023. The samples from surface water were taken directly in polyethylene bottles, while the bottom samples were collected using a Nansens bottle. The temperature was recorded at the time of sampling on the spot using a centigrade thermometer. The water transparency was measured by a secchi disk, pH was

measured with a standard pH meter, and DO, free Co_2, alkalinity, and hardness were determined by the procedures of APHA 1995 [12]. Some of the parameters were recorded at sampling sites, and other was analyzed in the laboratory.

Result

The rainfall in Baur Reservoir recorded during study time varied from 5 mm to 54mm. In November and December, there was no rainfall recorded in year 2022 while 2 mm to 455 mm rainfall recorded in year 2023 and January to April and September to November there is no rainfall recorded. The maximum rainfall was recorded at 54mm in month of July, and minimum rainfall was recorded in May, which is 5 mm (Table 1) year 2022 and similarly 455 mm rainfall recorded in month of july which is highest and 2mm in month of December (Table 2) which is lowest in year 2023. The humidity value was 45% to 80% in year 2022 and 62% to 92% in year 2023 higher humidity was recorded in summer and monsoon seasons and lower value of humidity was observed during the winter seasons (Table 1 and 2). The water temperature varies from 18^0c to 32^0c in spot 1 and 20^0c to 34^0c in spot 2 and 16^0c to 30^0 c in spot 1 and 18^0c to 32^0c in spot 2 in year 2023 respectively. The maximum water temperature was recorded in the month of August, which is 32^0c and minimum water temperature was recorded in the month of January, which is 18^0c in spot 1 and 20^0c spot 2. The study's findings support those of [13, 14, 15, 16] who discovered that summertime temperatures were greater than wintertime ones. Low temperatures throughout the winter may be brought on by chilly air, greater water levels, and less solar radiation, but consistent temperature rises during the summer may be brought on by a clear sky, lower water levels, a longer photoperiod, and more solar radiation. According to research by Verma [17] and Joshi [18], reservoirs in the Tarai region of Uttarakhand State often see average water temperatures above 20^0c, providing a favorable habitat for the development and survival of tropical fish. During the study period the p^H range varied from 6.8 to 9.0 in year 2022 and 6.4 to 7.8 in year 2023 at spot 1 and 6.8 to 8.4 in year 2022 and 6.8 to 8.0 in year2023 at spot 2, respectively shown in table 1and 2. The lowest p^H range was recorded at 6.6 and 6.8 in the months of July and November in spots 1 and 2 respectively. The highest p^H was recorded in the months of January and March, which were 8.2 and 8.4 in spot 1 and 2 respectively. The reservoir water remains Alkaline during most part of the year. The value of alkalinity was varied from recorded during the month of May, June, July and August in spot 1and 2, which is varied from 100$\pm$ 10 mg/l and 94 $\pm$ 10 mg/l in spots 1 and 2, respectively. The highest alkalinity was recorded in the summer month. According to Sharma *et.al.* [19, 20] the lowest value of alkalinity was recorded in summer month, and the highest value of alkalinity was recorded in winter month. The minimum value of hardness was recorded in February at 78mg/l and 74mg/l in spots 1 and 2 respectively and the maximum value of hardness was observed in May at 120mg/l and 115mg/l in spots 1 and 2, respectively denoted in. According to [21, 22, 23, 24], the increased value observed in summer and monsoon may be due to higher temperatures which may increase the concentration of salt by excess evaporation. The surface water of the reservoir is oxygenated for the majority of the year.

Table 1: Monthly variation of Physico-chemical parameters of Baur Reservoir (January to December 2022)

Months	Temp.		pH		DO		Co_2		T.D. Solid		Humidity	Rainfall	Hardness		Alkalinity	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2			S1	S2	S1	S2
Jan	18	20	8.2	8.4	9.2	9.0	10.0	9.6	120	130	45	28	88	84	150	160
Feb	22	24	8.0	7.6	8.8	9.2	12.0	12.2	140	110	48	15	86	82	130	140
March	20	24	9	8.4	6.2	7.1	7.2	9.0	122	130	50	10	96	88	130	120
April	21	26	8.2	7.2	7.8	8.4	6.1	7.0	120	125	60	10	100	94	118	110
May	22	24	7.1	7.4	8.2	8.6	7.0	7.2	132	136	80	5	120	115	110	115
June	30	28	7.1	7.4	8.1	7.8	8.4	7.2	140	140	78	8	115	120	100	96
July	26	28	6.8	6.6	9.8	9.6	8.4	8.2	132	135	78	54	110	115	105	100
Aug	32	34	7.0	7.0	8.4	7.2	7.1	6.8	145	146	80	15	100	98	100	94
Sep	28	26	7.2	7.0	7.8	7.2	6.1	7.0	114	128	76	10	98	96	110	100
Oct	26	24	7.0	7.2	7.0	7.4	6.2	7.4	116	126	70	34	105	98	115	105
Nov	22	26	6.8	6.6	8.0	7.8	7.6	6.8	112	122	68	-----	98	104	115	110
Dec	24	20	7.0	6.8	7.6	7.4	6.0	6.2	106	110	66	-----	96	98	120	115

Table 2: Monthly variation of Physico-chemical parameters of Baur Reservoir (January to December 2023)

Months	Temp.		pH		DO		Co_2		T.D. Solid		Humidity	Rainfall	Hardness		Alkalinity	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2			S1	S2	S1	S2
Jan	20	22	6.4	6.8	8.2	8.0	7.2	7.0	110	106	68	----	88	84	150	160
Feb	24	26	7.2	7.4	7.8	8.2	6.1	6.8	122	135	62	----	86	82	130	140
March	22	24	7.6	7.8	8.6	8.8	7.4	7.6	120	130	70	---	96	88	130	120
April	26	28	7.4	8.0	8.2	8.0	7.2	7.0	140	110	82	----	100	94	118	110
May	24	26	7.8	8.0	8.6	9.0	10	10.2	130	110	90	58	88	90	100	110
June	30	32	7.6	7.8	8.4	8.8	9.6	9.8	120	125	88	113	86	88	100	105
July	28	30	7.8	7.4	8.2	8.6	9.4	9.6	126	130	90	455	88	90	105	110
Aug	24	28	7.2	7.6	8.4	8.8	9.0	9.4	120	140	86	443	100	105	110	115
Sep	26	28	7.0	7.2	8.6	8.8	8.6	8.8	126	138	92	---	96	98	120	110
Oct	24	26	6.8	7.4	7.0	8.4	6.2	7.4	130	128	90	----	105	100	115	105
Nov	22	24	6.4	7.2	7.8	8.6	6.0	6.4	130	138	76	-----	110	108	120	110
Dec	16	18	7.0	7.4	8.2	8.4	7.0	6.8	121	120	56	2	115	112	110	115

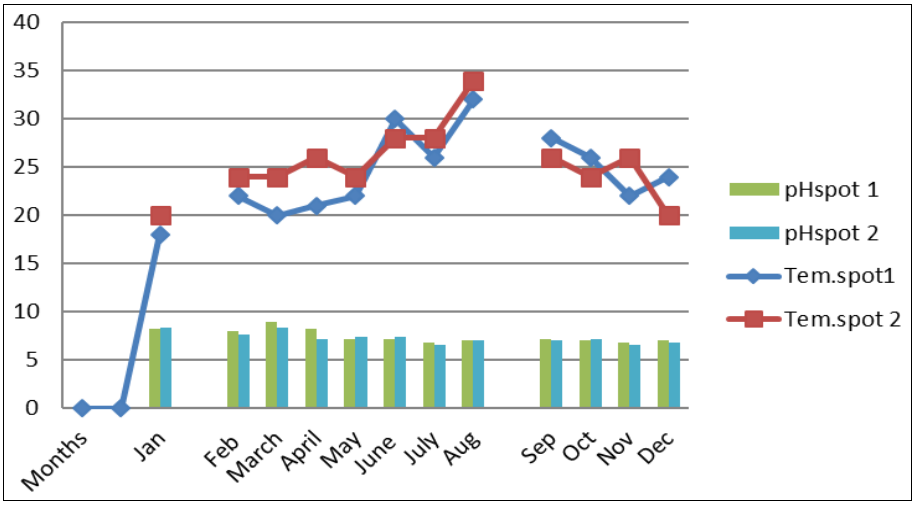

Fig 1 : Monthly variation between Temperature and p^H in spot 1 and 2 at Baur reservoir from January 2022 to December 2022.

Fig 2 : Monthly variation between Temperature and p^H in spot 1 and 2 at Baur reservoir from January 2023 to December 2023.

Discussion

The results of this investigation demonstrated that these water bodies' limnological features are favorable for the greatest development of phytoplankton and zooplankton. These two spot of this reservoir are highly interfered by human, so we can say the parameters of these spot with respect to reservoir. It has been shown that the limnological features influence the architectures of phytoplankton and zooplankton. All the physico-chemical parameters shows that reservoir water can be used for irrigation purposes and with only two spots we can say this because these areas of this reservoir are mostly interrupted by humans, especially spot 1. With the help of this study, we can find the present status of reservoir water.

References

1. Chaudhari S, Banerji T. Arsenic removal from drinking water by electrocoagulation using iron electrodes—an understanding of the process parameters. J Environ Chem Eng,2016:4(4):3990-4000. doi: 10.1016/j.jece.2016.09.007.
2. Gulumbe BH, Aliyu B, Manga SS. Bacteriological and physico-chemical analyses of Aliero dam water. PARAMETERS,2016:2:30-34. Available from: http://www.researchgate.net/publication/340464631.
3. Mora A, Mahlknecht J, Rosales-Lagarde L, Hernández-Antonio A. Assessment of major ions and trace elements in groundwater supplied to the Monterrey metropolitan area, Nuevo León, Mexico. Environ Monit Assess,2017:189(8):1-15. doi: 10.1007/s10661-017-6096-y.
4. Desai VR. Reservoir fisheries. In: Handbook of fisheries and aquaculture. New Delhi, India: Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, 2006, 173-195.
5. Mishra A. Study of biodiversity of selected reservoirs of Uttarakhand. PhD thesis. Mumbai, India: ICAR-Central Institute of Fisheries Education, 2007, 1-169.
6. Pathani SS, Joshi P. Ichthyo-fauna and fishery in the Nanak Sagar reservoir of Uttarakhand, India. Aquacult,2007:8(2):191.
7. Joshi P. Studies of primary and secondary productivity in Nanak Sagar reservoir. Thesis submitted to K.U. University Nainital, 2006. Available from: http://hdl.handle.net/10603/171019.
8. Mishra A, Srivastava A, Singh UP. Limnological studies of fish ponds in Tarai region of Uttar Pradesh. Environ Ecol,2003:21(3):623-627. Available from: http://dx.doi.org/10.18782/2320-7051.7695.
9. Bepler G, Sharma S, Cantor A, Gautam A, Haura E, Simon G, *et al*. RRM1 and PTEN as prognostic

parameters for overall and disease-free survival in patients with non–small-cell lung cancer. J Clin Oncol,2004:22(10):1878-1885. doi: 10.1200/JCO.2004.12.002.
10. Bala M, Sheela P. A study on the diversity and community structure of freshwater zooplankton and ichthyofaunal in Kumaraswamy Lake, Coimbatore district, Tamil Nadu. J Mater Environ Sci, 2022. Available from: http://www.jmaterenvironsci.com.
11. Pravin M, Archana. Physico-chemical condition and plankton diversity of Godavari River in city area of Maharashtra. Int J Ecol Environ Sci, 2020, 373-379. Available from: https://www.researchgate.net/publication/348916076.
12. Adoni AD. Workbook on limnology. Sagar, India: Prativa Publishing,1995, 209.
13. Das SM. Handbook of limnology and water pollution with practical methodology. New Delhi, India: South Asian Publication, 1989, 174.
14. Sharma DK. An assessment of phytoplankton diversity of Tighra Reservoir, Gwalior (Madhya Pradesh). Int J Sci Res,2013:2(12):568-571. doi: 10.1537/2277-8179/DEC2013/180.
15. Garg RK, Rao RJ, Uchchariya D, Shukla G, Saxena DN. Seasonal variation in water quality and major threats to Ramsagar Reservoir, India. Afr J Environ Sci Technol,2010:4(2):61-76. Available from: http://www.academicjournals.org/AJEST.
16. Jawale AK, Patil SA. Physico-chemical characteristics and phytoplankton abundance of Mangrul Dam, Dist - Jalgaon, Maharashtra. J Aqua Biol,2009:24(1):7-12.
17. Verma R. Water and fishery resources of Kumaun Central Himalaya, India. Discovery,2013:8(19):7-12. Available from: www.discoveryjournals.org.
18. Joshi P, Joshi R. Assessments of water quality and plankton diversity in Baur Reservoir, Uttarakhand, India. Uttar Pradesh J Zool,2024:45(14):45-55. doi: 10.56557/upjoz/2024/v45i144178.
19. Sharma A, Sharma RC, Anthwal A. Monitoring phytoplanktonic diversity in the hill stream Chandrabhaga of Garhwal Himalaya. Life Sci J,2007:4(1):80-84. Available from: http://life.zzu.edu.cn.
20. Tidame SK, Shinde SS. Studies on seasonal variations in physico-chemical parameters of the Temple Pond Nasik District (MS), India. Int Multidiscip Res J, 2012, 2(5). Available from: http://irjs.info.
21. Joshi P. Some physico-chemical factors of Nanak Sagar Dam, Uttarakhand (India). J Global Biosci,2022:11:9238-9243. Available from: www.mutagens.co.in/jgb/vol.11/110302.pdf.
22. Majare SA, Vhanalakar SA, Muley DV. Analysis of water quality using physico-chemical parameters in Tamdalge Tank, Kolhapur District, Maharashtra. Int J Adv Biotech Res,2010:1(2):115-119. Available from: http://www.bipublication.com.
23. Mehta MB. Drinking water quality of ground water from selected sample points around Thane district of Maharashtra. J Ind Pollut Control,2003:19(2):153-157.
24. Joshi P, Tripathi P. A case study of some biotic factors of Nanak Sagar Reservoir, Nanak Matha (U.K.), India. J Environ Bio-Sci,2010:24(1):121-125.