Physicochemical Analysis of Nalganga Reservoir Water From Buldhana District of Maharashtra, India.

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***Abstract*- The Nalganga reservoir is located in Movtala Taluka, District Buldhana, Maharashtra, the closet city to Malkapur (Latitude: 200 43' 34" N, Longitude: 760 10' 49" E). The study and analysis of water quality assessment took place over a full year, from October 2022 to September 2023. The physiochemical parameter of water such as, Temperature, pH, Dissolved oxygen, chloride, Calcium, Magnesium, Potassium, free CO2, TDS, BOD, COD, alkalinity, Nitrates, Phosphate, dissolve solids, turbidity, carbonates, bicarbonates and total hardness were studied. The finding showed that several physicochemical characteristics showed substantial seasonal change, although the majority of the data were within normal range and suggested that the reservoir water was of higher quality. It has been found that the water is perfect for irrigation and drinking.**

***Index Terms*- Nalganga Reservoir, Physicochemical Parameters. Water Quality.**

I. INTRODUCTION

Fresh water is one of the source natural recourses conservation which is assuming greater and greater important due to over increasing demand in domestic, industrial and agricultural Sectors, on the one land and its grows pollution to water. Generally most of the water requirement in various sectors is made by rivers, lakes and manmade reservoirs. Water is essential to human life and is rich in nutrients and minerals. The earth`s geological structure and human activities like construction, garbage disposal, agriculture, and to the related activities that deplete water resources are two factors that affects a lake`s water quality. Water changes properties when it percolates through the soil, becoming less drinkable and sometimes even inedible due to the enormous number of soluble and insoluble chemicals it absorbs. The main supply of fresh water comes from surface water features including lakes, springs, and rivers. People rely on groundwater for their normal water supply because surface water resources are insufficient. In this perspective lakes which can be classified as either natural or man-made are among the most important water resources because they have been utilized as a source of water primarily for irrigation and human consumption. The high slopes of Ajanta are the source of the Nalganga River. This region is totally mountainous in the surrounding of this reservoir many small villages have located, the water is provided by this river, and due to this reservoir they get enough water to be used for agriculture and drinking. Some rivers and streams feeding Nalganga reservoir have also originated from the hills of Ajanta. Ponds, lakes, reservoirs, rivers, and streams are the sources of surface inland water. Reservoir, as it built by damming the river therefore there will be some effect on its limnological characteristics as it changes from flowing to standing ecosystem. It is very obvious when an aquatic ecosystem get converted into lotic to lentic ecosystem the general profile of physical, chemical and biotic characters get changed.

The current study examines the relationship between physical and chemical characteristics and water quality of Nalganga reservoir. The Nalganga reservoir is located in Movtala Taluka, District Buldhana, Maharashtra, the close to the city to Malkapur (Latitude: 200 43' 34" N, Longitude: 760 10' 49" E). The earth fill gravity reservoir near Malkapur is situatedacross the Nalganga. It is make for good picnic spots and also popular tourist attraction for its scenic beauty. Reservoirs are mostly used for irrigation and drinking.The water from Nalganga reservoir was examined and its physicochemical properties investigated for a periods from October 2022 and September 2023. The ecological and physicochemical characteristics of India's rivers and reservoirs have been the subject of several studies. Trivedy and Goel (1986), Saxena (1990), APHA (1992), Diwakar (1995), Gupta (2007), Jakher et al. (1990), Patil et al. (2003), Subba Rao (1993), and Kodarkar (1992) all employed standard methodologies to examine the physicochemical features.

II. MATERIALS AND METHODS

Study Area:

Nalganga reservoir is located in Buldhana district (Latitude 20^0 43' 34" N and Longitude. 76^0 10' 49" E) which is situated in the nearest city of Malkapur in Motala Taluka, in Maharashtra state. Around 8741 hectors land of 28 villages. This reservoir spans 1098 hectors and has several advantages. The purpose of this water reservoir is irrigation as well as drinking. The residents in the adjacent villages may make a living from the lake, which is abundant in fish. The dam produce reservoir that store water for uses like agriculture, drinking, aquaculture, and navigation in addition to reducing floods.

Sampling station:

The lake was observed both physically and chemically between October 2022 and September 2023. The samples of Nalganga reservoir surface water were taken from three sampling points between 10.00 morning and 12.30 in the afternoon. Every month, samples were collected and stored in two-litre plastic cane. Collected water samples were brought to the laboratory for the estimation of various parameters. The physicochemical analysis includes parameters such as pH, Temperature, Dissolved oxygen, Calcium, Magnesium, Turbidity, TDS, BOD, COD, alkalinity, Nitrates, Phosphate, dissolve solids and total hardness were analysed as per standard methods (Trivedy and Goel (1986), Saxena (1990), APHA (1992), Diwekar (1995) and Gupta 2007.)

III. RESULTS AND DISCUSSION

The seasonal variation in physico-chemical parameters of the Nalganga reservoir have been given in the table 1. water quality assessment of Nalganga reservoir was under taken from October 2022 to September 2023 with view of investigate the various changes in physicochemical features for confirming the good quality of water resources large number of physico-chemical parameters.Temperatures one of the important physical characteristics which directly influence of some chemical reaction in aquatic ecosystem. The atmospheric temperature was recorded between 23.8 ℃ to 34.1 ℃. It was maximum in the month of May of summer season and minimum in month of December in winter season. The atmospheric temperature is important and plays an important role in the environment. Similar observation by; APHA (1992) Sawdekar et al. (2021). The water temperature was recorded between 11.3 mg/lit to 25.7 mg/lit. It was maximum in the month of May in summer season while minimum in January in winter season. The temperature is the most important factor which influence the chemical, biological and bio-chemical features of the body. The water temperature were observed similar finding by Pawar & Phule (2005), Lokhande (2013) and Kumar et al. (1996).

The pH was slightly alkaline. The value being greater than 7 for selected station. It was recorded maximum 8.9 in the month of May in summer season and minimum in the month of November 7.10 in monsoon season at sampling stations. The pH of natural water provided important information about many chemical and biological processes and provide direct correlation to a different impairment of environment. Many workers studied on pH ranges by Bhargavi et al. 2023 and Kaushik et al. 2004. Total dissolve solid are various kinds of mineral substances present in water. The TDS ranges from 287.4 mg/lit to 510.4 mg/lit in the sampling stations and maximum in the month of September in monsoon season while minimum in the month of January in winter season. The high level of TDS in drinking water cause laxative effects. Ajagekar el al. (2011) stated that the TDS are the amount of particle thet are dissolved in the water. Similar finding results by Musaddiq and Folkmare (2002).

Total hardness is governed by the concentration of Ca^{++} and Mg^{++} Salts largely combined with bicarbonates and carbonates giving temporary hardness while sulphate, chloride and other anions of mineral acids causing permanent hardness. Total hardness of water is the sum of concentration of alkaline earth metal cataions. The hardness values fall between 421.6 and 606.2 mg/lit. The month of May during the summer season had the highest value, while the month of September during the monsoon season had the lowest. Salve et al. (2008), Hujare (2008), and Khan et al. (2012) all reported similar findings. The values of turbidity were recorded ranged between 7.10 mg/lit to 5.38 mg/lit. The minimum in the month of February in winter season and maximum turbidity in September of monsoon season. Turbidity is the suspension of particles in water that prevent light from passing through. A wide spectrum of suspended matter, from pure inorganic chemicals to highly organic ones, can generate turbidity. Depending on the degree of turbulence, the suspended matter can range in size from colloidal to coarse dispersion. Garg et al. (2006) and Nikam et al. (2011) have reported similar findings.Recorded the highest turbidity in monsoon.

In the present study, the total alkalinity recorded ranged between 414.8 mg/lit to 561.3 mg/lit. The total alkalinity were recorded minimum in January month of winter

season, while maximum in the month of May in summer season. Alkalinity of water is measure of its capacity to neutralize acids. This is due to the primarily salts of weak acids and strong bases. Bio-carbonates represent the measure form of alkalinity. Bicarbonates are formed in considerable amount from the action of carbon-dioxide upon basic materials. The salts of carbonates, bicarbonates, phosphates, and nitrates are typically responsible for imparting it. Similar observation reported by Abhasi et al., (1999) and Sawdekar et al.(2021).

Nitrate is a crucial nutrient that speeds up the growth of macrophytes and algae and determines the productivity of aquatic ecosystems. It is an important nutrient for the growth of phytoplankton and helps in eutrophication. The range of nitrates was 2.0 mg/lit to 3.52 mg/lit. The maximum value was recorded in the month of June during rainy season and minimum in the month of January of winter season. The high value of nitrate in June is mainly due to rains, surface runoff, agricultural runoff, decomposition of macrophytes. (Pearsall (1932) and Udama 2014) reported that nitrates was the main factor controlling the phytoplankton periodicity. Chloride is a natural substance present in all portable water as well as sewage effluents and metallic salt. The ranged recorded minimum in May 120.5 mg/lit and minimum in September 159.3 mg/lit. Calcium is most abundant ion in the fresh water and in an important in shell construction, bone building and plant precipitation of lime. It's ranged between 70.3 mg/lit to 96.2 mg/lit, increased in May and decrease in October. The maximum value of 95.6 mg/lit was recorded during summer season and minimum in the month of September monsoon season. Considerable amount of magnesium influence water quality (Venkatasubramani et al., 2007). Carbonates indicate temporary hardness of water. It ranges from 13.7 mg/lit to 23.5 mg/lit (Hegde et al., 2005). Bicarbonate serves an important role in water body. Biocarbonate levels ranged from 156.8 mg/lit to 188.3 mg/lit. In natural fresh water phosphorus is in low concentration. The higher concentration of phosphorus is indicative of pollution. The range of phosphorus was recorded 1.03 mg/lit to 2.24 mg/lit. Potassium also found in considerable amount in natural water. In present study potassium concentration varies in the range of 5.9 mg/lit to 7.51 mg/lit.

The amount of oxygen dissolved in reservoir is affected by temperature of water, salinity, water inflow and photosynthetic activity of algae and water plants. Dissolve oxygen is one of the most important factor of water quality that gives an indication of organic pollution in water body The DO were noted value in the range of 6.1 mg/lit to 7.9 mg/lit. The winter season's highest value was recorded in January, and the summer season's lowest value was reported in May (Kaushik et al., 2004). BOD values ranged between 7.20 mg/lit. To 9.22 mg/lit. Maximum values recorded in the month of May in summer season and minimum in the month of January in winter season. The biochemical oxygen demand is indication of relative oxygen requirements of water for oxidation and organic matter. The atmospheric oxygen dissolved in water is used by microorganisms. The high BOD in the summer may have been caused by a number of microorganisms in the water body that accelerated their metabolic processes with concentrated organic matter. As a result, they needed more oxygen, which raised the demand for oxygen (Verma et al., 2012). The amount of inorganic and organic compounds that must oxidize in water is measured by the chemical oxygen demand. The quantity of dissolved oxygen needed to cause chemical oxidation of the organic material in water is known as the chemical oxygen requirement. The values of COD were recorded ranged between 32.3 mg/lit to 55.10 mg/lit. The maximum value in the month of May in summer season and minimum values in the month of January in winter season. Similar observation made by Sharma et al. (2010) and Zombade et al., (2012).

IV. CONCLUSION

Analysis of Physico-chemical parameters on Nalganga Reservoir showed that the values are well within the permissible limit of WHO and BIS standards. There was no pollution in this Reservoir due to sewage or industrial effluents. It is safe to consume the water from the Nalganga Reservoir. It is also useful for domestic, irrigation and fish culture activities because the physico-chemical parameters are in suitable range of the growth of fishes, molluses zooplankton and phytoplankton. A clean and fresh environment is necessary for a healthy life. It is responsibility of everyone to conserve water and avoid its contamination.

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Table 1: Physicochemical parameters analysis of surface water Nalganga reservoir from October 2022 to September 2023

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
Water temp.(^{O}C)	14.4	13.6	12.7	11.3	18.6	17.9	24.2	25.7	21.5	20.8	16.9	15.4
Atmospheric temp. (^{O}C)	28.6	27.1	23.8	24.5	26.6	29.1	32.4	34.1	31.2	30.3	29.7	29.1
pH	7.25	7.10	7.50	7.80	8.26	8.40	8.61	8.90	7.40	7.41	7.31	7.34
Total Dissolved solids (mg/L)	357.1	370.4	294.2	287.4	367.4	391.3	400.1	380.8	456.2	485.3	460.2	510.4
Free carbon dioxide	00	00	00	00	00	00	00	00	00	00	00	00
Turbidity (mg/L)	8.28	8.21	8.12	8.18	7.10	7.14	7.20	7.30	7.80	7.92	8.20	8.38
Total phosphorus (mg/L)	1.21	1.24	1.03	1.40	1.32	1.61	1.95	1.65	1.83	1.92	2.24	2.22
Potassium (mg/L)	6.5	5.2	5.10	5.9	7.5	6.2	6.5	6.9	7.3	7.20	7.51	7.46
Nitrogen (mg/L)	3.5	3.10	3.52	3.18	3.0	2.01	3.0	2.0	2.5	2.8	3.1	2.01
Total hardness (mg/L)	561.7	530.4	466.6	428.8	485.4	470.6	468.3	606.2	524.2	512.5	520.3	421.6
Chloride (mg/L)	139.3	149.8	155.2	151.4	153.1	144.6	157.8	159.3	135.6	126.7	123.5	120.5
Calcium (mg/L)	70.3	72.6	74.6	78.8	81.6	81.2	87.4	96.2	88.4	80.2	76.2	74.6
Magnesium(mg/L)	82.4	81.8	79.8	80.7	83.8	86.6	91.4	95.6	89.1	83.5	80.2	78.1
Total Alkalinity (mg/L)	418.2	422.5	415.2	414.8	428.4	430.2	471.3	561.3	449.6	425.1	424.1	418.8
Carbonates (mg/L)	14.5	13.7	15.4	18.9	21.1	21.7	22.4	23.5	21.2	20.8	20.9	20.1
Bicarbonates (mg/L)	180.5	185.2	185.4	188.3	170.5	172.2.	170.4	171.3	160.6	156.8	161.0	162.5
Dissolve Oxygen (mg/L)	6.1	7.5	7.6	7.9	6.9	7.5	6.8	5.7	6.3	7.1	7.4	7.5
Chemical Oxygen Demand (mg/L)	35.08	36.2	41.0	32.0	50.21	49.40	43.6	55.10	40.6	39.9	38.2	37.6
Biological Oxygen Demand (mg/L)	8.60	7.80	7.78	7.20	7.70	7.76	8.51	9.22	9.18	9.12	9.02	9.00