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A study on limnological aspects of Moti Talab in Balaghat District (M.P.) India

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Abstract

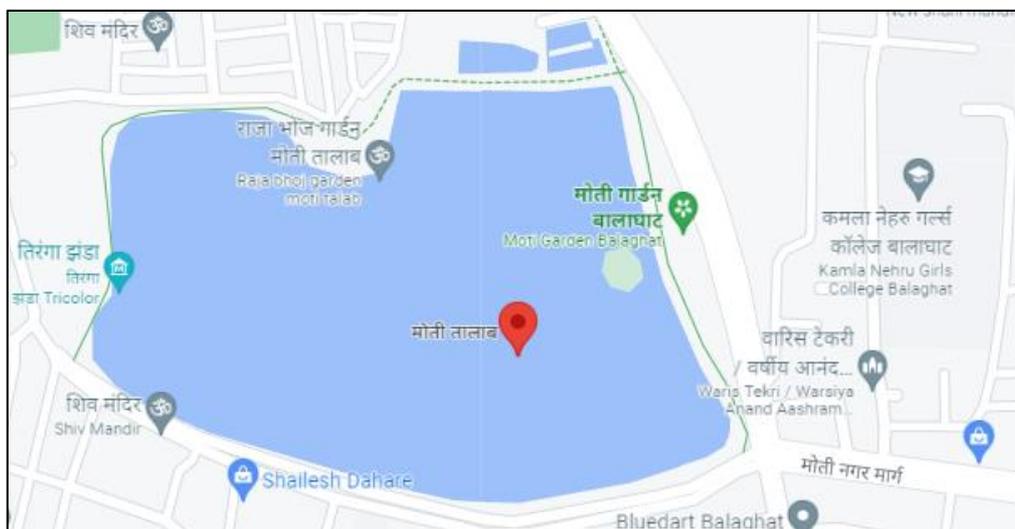
Present paper Study with the limnological aspects of Moti Talab in Balaghat district. The Physico-chemical characteristics of this Talab has been studied and analyzed for a year, i.e., from during March 2020 to February 2021. Water samples were collected from four seasons throughout the Talab. The following parameters were analysed: Water temperature, pH, turbidity, chlorides, Alkalinity, Hardness, Dissolved Oxygen, Biochemical Oxygen Demand and Chemical Oxygen Demand has been analysed. The study revealed that the lake water showed high turbidity values in rainy season. Further, chlorides and hardness was shown to be little higher than the Indian standards (BIS). Still the values of chlorides were present within permissible limits. Though Chemical Oxygen Demand was observed to be little high, it was present within acceptable limits.

Keywords: Limnological study, Physico-chemical characteristics, Balaghat Distract, Moti Talab

Introduction

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is dependent on the physico-chemical and biological characteristics (Boyd and Tucker, 1998; Garg *et al.* 2006b; Kashyap, 2016) [3, 9, 12]. The quality of water in any Ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of Physico-chemical parameters and biological characteristics. Any characteristic of water that affects the survival, reproduction, growth and production of aquaculture species, influences management decisions, causes environmental impacts or reduces product quality and safety can be considered a water quality variable. Limnology and water quality provide current information about the concentration of various solutes at a given place and time. Water quality parameters in specific, provide the basis for judging the suitability of water for its designated uses and to improve existing conditions. The study sites comprise of various forest communities spread all over Balaghat district. The district is located in the south-eastern Madhya Pradesh encompassing latitude 21°19' to 22°24' North and longitude 79°31' to 81°3' east in the eastern part of Satpura plateau. The district of Rajnandgaon and the state of Chhattisgarh in North-east, Mandla district in the north, Seoni district in the west, and Bhandara district in the state of Maharashtra from the southern geographically boundary. Moti Talab is a visible site of Balaghat. It is located in Moti Nagar, it is located in Ambedkar Chowk.

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Map 1: Showing Moti talab, Balaghat district.

To assess that monitoring of these parameters is essential to identify magnitude and source of any pollution load. These characteristics can identify certain conditions for the uses of water for agriculture and several other purposes, which in turn suggest appropriate conservation and management strategies. Many researches are being carried out till present (Chatawal, 1998; Rajesh *et al.* 2002, Jayaraman *et al.*, 2003; Sharma & Gupta 2004; Rajasekar *et al.*, 2005; Sridhar *et al.*, 2006; Anilakurmar *et al.*, 2007; Prabu *et al.*, 2008; Raja *et al.*, 2008; Pradhan *et al.* 2009; Damotharan *et al.*, 2010; Prasanna and Ranjan, 2010; Rana, 2015 & 2016; Kashyap, 2016; Prajapati, 2016; Shukla and Upadhyay, 2017, Khandayat, Poornima and Singh, 2019a and Mishra and Singh, 2021) [4, 21, 11, 25, 20, 27, 1, 15, 19, 16, 7, 18, 22, 23, 12, 17, 26, 13, 14].

In order to assess water quality of Moti Talab, physicochemical analysis of Talab water has been attempted. The aim of the study is to rule out the pollution status of Talab in terms of physico-chemical characteristics of water, which calls for best management strategies to reduce pollution.

However, very little information is available in relation to physico-chemical characteristics of water in this talab. Hence, the preset study was conducted to study the physico-chemical properties of water of summer, rainy, winter and spring seasons in talab for a period of one year from March 2020 to February 2021.

Materials and Methods

To study water quality status of the talab, water samples were collected. The study was carried out for a period of one year. Water samples were taken 4 times in a year *i.e.*, in the month of March, June, September and November for Analysis. By considering the morphometry and human activities sampling sites were selected at different places along the talab, water samples were collected from the periphery at about 1 to 1.5 meters depth fortnightly. The water samples were collected in plastic cans of 2-3 lit. capacity and brought to the laboratory to study various parameters. Some of the results were recorded at the sampling whereas the others were recorded in the laboratory, according APHA, 2005 [2].

Results and Discussion

Values of Physico-chemical parameters are presented in Table 1 and seasonal variation is shown in fig. 1.

Water temperature: Temperature of Moti talab water ranged from 24.75 °C to 28.5 °C in different seasons (Figure-1). High seasonal variations were observed at all the seasons. Water Temperature was high due to low water level, high air temperature and clean atmosphere. Similar results were reported by Khandayat and Singh, 2019a [13] and Mishra and Singh, 2021 [14].

pH: pH range of 6.5 to 8.5 is normally accepted as per guideline suggested by WHO. During present study, water pH values of Moti talab water were found around 6.98 to 7.12. (Table 1) at all seasons. It is indicating slightly alkaline nature throughout the study period (Fig. 1). The high values may be due to attributed sewage discharged by surrounding city and agricultural fields. pH value is very important for plankton growth (Chisty, 2002) [5]. According to Umavathi *et al.*, (2007) [29] pH in the range of 5 to 8.5 is best for phytoplankton growth.

Turbidity: In the present study, water turbidity values ranged from 1.1 to 9.5 NTU (Table 1). High turbidity values were found in rainy season. (Fig. 1). The results supported by Dagaonkar and Saksena (1992) [6], Garg *et al.*, (2006b) [9], Prajapati, (2016) [17] and Khandayat and Singh (2019a) [13] and Mishra and Singh, 2021 [14] have also reported high turbidity during rainy season. During rainy season silt, clay and other suspended particles contribute to high turbidity values, while during winter and summer seasons settlement of silt, clay results low turbidity.

Alkalinity: Alkalinity is a measure of the buffering capacity (ability to resist changes in pH) of the water, and since pH has a direct effect on organisms as well as an indirect effect on the toxicity of certain other pollutants in the water, the buffering capacity is important to water quality. Commonly occurring materials in water that increase alkalinity are carbonates, bicarbonates, phosphates and hydroxides. The Alkalinity of Moti talab waters ranged from highest value of 21.2 ppm during rainy season to the lowest value of 18.1 ppm during spring season (Figure-1). Rana, 2016 [23] has also made similar observations in Mohan Ram Lake Shadhol (M.P.).

Chlorides: Chloride were found to be high during the entire period of study. Chlorides at different seasons ranged from

36.37 ppm summer season to 41.45 ppm rainy season (Figure-1). Similar results were reported by Swarnalatha and Nasing Rao (1998) [28]; Umavathi *et al.*, (2007) [29]; Rana (2016) [23] and Shukla and Upadhyay, (2017) [26]. Higher concentration of chloride is association with increased level of pollution.

Total hardness: In the present study, total hardness ranged from 165.1 ppm to 195.4 ppm in different seasons (Figure-1). These high values may be due to the addition of calcium and magnesium salts. The increase in hardness can be attributed to the decrease in water volume and increase in the rate of evaporation at high temperature. High values were recorded in summer season. Hujare (2008) [10] reported that total hardness was high during summer than rainy season and winter season. Khandayat and Singh, 2019a [13] has also made similar observations in Gangulpara dam in Balaghat (M.P.), India.

Dissolved oxygen: Dissolved oxygen is an important aquatic parameter, whose presence is vital to aquatic fauna. It plays crucial role in life processes of animals. In the present study the DO values found to be in the range of 4.5 ppm during summer season to 6.8 ppm during spring season. Rani *et al.*, (2004) [24] reported lower values of

Dissolved oxygen in summer season due to higher rate of decomposition of organic matter and limited flow of water in low holding environment due to high temperature.

Biochemical oxygen demand (BOD): Biological oxygen Demand (BOD) is an important parameter to the oxygen required to degradation of organic matter. BOD recorded from 2.18 to 4.02 ppm which is within the permissible range (Figure-1). Devaraju *et al.*, (2005) [8] has made similar observations in Maddur Lake and Garg *et al.*, 2009 [6] has also made similar observations in Ramsagar reservoir. High BOD value is unflavoured with zooplankton.

Chemical Oxygen Demand (COD)
Chemical oxygen demand (COD) is a measure of the capacity of water to consume oxygen during the decomposition of organic matter and the oxidation of inorganic chemicals such as ammonia and nitrite. COD measurements are commonly made on samples of waste waters or of natural waters contaminated by domestic or industrial wastes. The COD values in the present investigation ranged between 238.7 to 249.3 ppm throughout the study period (Figure-1). Khandayat and Singh, 2019a [13] has also made similar observations in Gangulpara dam in Balaghat (M.P.), India.

Table 1: Showing Physico-chemical characteristics of water collected from Moti Talab, Balaghat (M.P.) during March-2020 to February - 2021.

S. No.	Physico-Chemical parameters	Summer season (March-May)	Rainy season (June-Aug.)	Winter season (Sept.-Nov.)	Spring season (Dec.-Feb.)
1.	Temperature °C	28.5±2.06	26.8±3.01	24.75±0.14	27.20±1.22
2.	pH	6.98±3.05	7.0±1.05	6.99±1.11	7.12±1.09
3.	Turbidity (NTU)	1.1±1.25	9.5±2.06	0.8±0.9	1.5±2.03
4.	Alkalinity (ppm)	19±2.09	21.2±4.08	20±4.01	18.1±3.52
5.	Chlorides (ppm)	36.37±4.12	41.45±4.05	38.03±5.2	37.31±3.6
6.	Hardness (ppm)	195.4±8.21	166.1±6.54	175.8±6.8	186.5±7.2
7.	Dissolved Oxygen (ppm)	4.5±2.05	5.8±3.2	5.1±2.9	6.8±2.04
8.	Biochemical Oxygen Demand (ppm)	4.02±1.65	2.18±1.44	2.7±1.88	3.5±2.03
9.	Chemical Oxygen Demand (ppm)	246.8±5.62	239.2±4.32	238.7±3.22	249.3±3.58

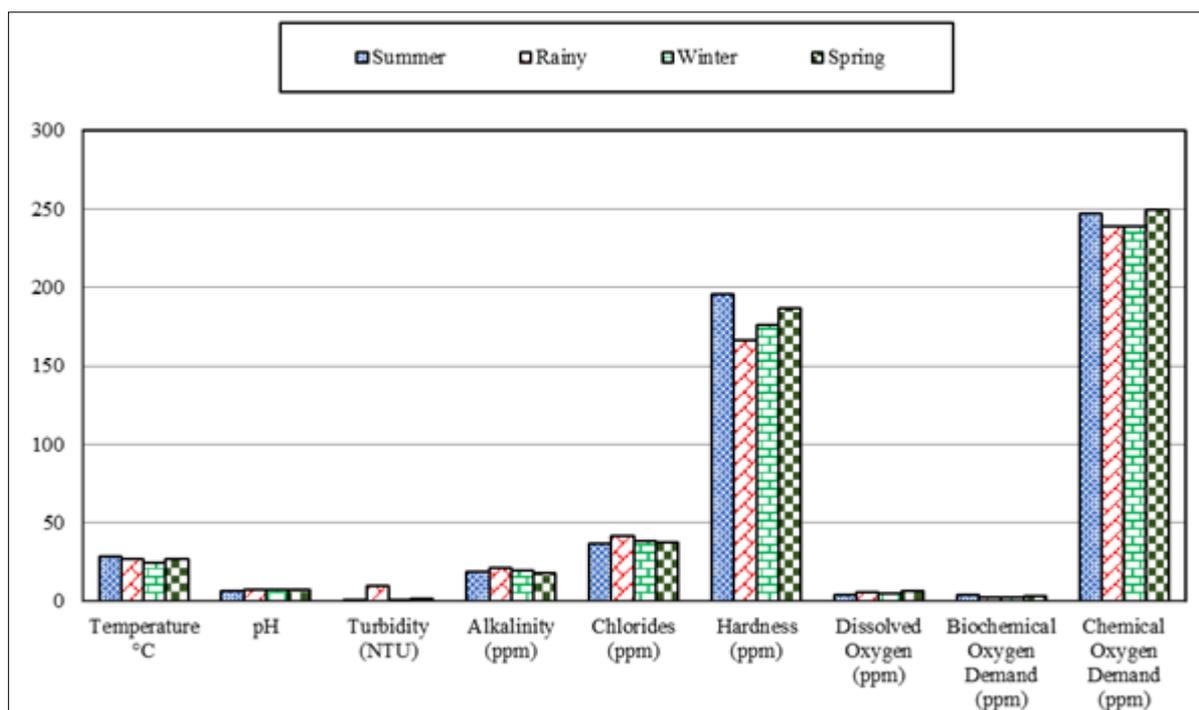


Fig 1: Graphics analysis of Physico-chemical Characteristics of water collected from Moti Talab dining March-2020 to February- 2021.

Conclusion

All the physical and chemical properties of Moti talab water were within desirable limits. Lot of fluctuation were seen in all the parameters. Turbidity was very less in summer season, showing that the water was very clear. All the parameters were present within permissible limits throughout the talab. Seasonal differences may be due to the Immersion of Ganesh idols at the time of festival season. High value of chlorides in winter season may be attributed to the addition of pollutants. Chemical Oxygen Demand was high throughout the lake indicating Organic pollution. The results obtained clearly suggests that the Moti talab water consist of Organic pollutants and the talab is in the verge of Eutrophication. If the same situation persists to continue in future, then there is a possibility of the talab for converting into a Moti talab water body.

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