

LIMNOLOGICAL STUDY OF MOHGAVHAN LAKE, KARANJA (LAD) DISTRICT – WASHIM, (M.S.) INDIA.

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ABSTRACT

The present paper deals with the physico-chemical properties of Mohgavhan lake of Karanja (Lad), Washim district during June 2004 to May 2005 to assess the water quality status for limnological study. The physico-chemical factors such as humidity, water temperature, transparency, pH, dissolved oxygen and various inorganic contents were investigated. Humidity fluctuated from 25.80 to 90.60 %, Water temperature 19.50 to 29.20^o C, Transparency 16.65 to 41.00 cm, pH 7 to 7.15, Dissolved oxygen 5.40 to 10.80 mg/L, Total Alkalinity 120.50 to 193.00 mg/L Total Hardness 98.50 to 181.80 mg/L, Calcium Carbonate 51.45 to 133.88 mg/L, Calcium 20.60 to 53.61 mg/L, Magnesium 13.26 to 41.36 mg/L, Chlorides 12.14 to 38.35 mg/L, Sulphates 0.03 to 0.09 mg/L, Nitrates 0.10 to 0.32 mg/L, Total Phosphates 0.03 to 0.58 mg/L, Total Solids 282.50 - 1126.75 mg/L

Key Words: Mohgavhan lake, Limnological study, Physico-Chemical Properties.

Introduction

Lakes are socioeconomically and bioaesthetically important aquatic ecosystem. Water is a essence of life and it is needed for drinking purposes, domestic uses, for irrigation of crops, production of different goods and for recreational purposes. Global studies show a challenging future and a chaotic view when considering total use and water availability, in third millenium.

The physico-chemical characteristics of any water body or any aquatic ecosystem and the nature and distribution of its biota are directly related to and influenced by each other and controlled by a multiplicity of natural regulatory mechanisms. Living plants and animals are affected by chemical conditions of their environment and the reactions may be used to measure some of the conditions. A systematic attempt has been made to study the

spatial and temporal variations of it's hydrochemical conditions with a view to evaluate the current status of water quality of the lake and delineate the source and extent of pollution.

The lentic water body selected for the present investigation is located 16 Km to the North of the Karanja (Lad) town. It in about 404.16 Km above MSL and located at 77^o34' E - longitude and 20^o 34' N - latitude.

Materials and Methods

Water samples from Mohgavhan Lake were collected from five sampling spots in the morning hours on a monthly basis for the period of one year from June 2004 to May 2005 in a clean polythene containers and immediately transported to the laboratory for the estimation of various physico-chemical properties. Parameters

like temperature, humidity, transparency, pH and dissolved oxygen were recorded at lake site where as the parameters like alkalinity, hardness, chlorides, total phosphates, nitrates, sulphates and total

Results and discussion

Humidity is expressed in terms of percentage of water vapours present in the air at certain temperature. The atmospheric humidity directly influences physiological activities of aquatic organisms. The humidity of the lake was in the range of 25.80 % to 90.60 %. Humidity was observed as maximum during monsoon 2004 and minimum during summer 2005. Our findings are in agreement with Ahmed and Krishnamurthy (1990) who recorder the maximum percentage of humidity during monsoon and minimum in summer at Wohar Reservoir, Aurangabad (M.S.) India. Similar results were recorded by Kedar and Patil (2002) while studying the limnology of Rishi lake, Karanja (Lad), District-Washim, and Ramalingam and Ramrani (2004) while studying the Velachary lake, Chennai.

Temperature is basically an important factors for its effects on chemical and biological reactions in water. It is one of the most important factors having profound influence on the biotic communities. During present investigation the observed average water temperature ranged between 19.50⁰ C to 29.20⁰ C. In general the temperature values were low during winter and high during summer, almost matching the environment temperature. Similar results, were recorded by Jha and Barat (2003) in Mirik lake,

solids were estimated in the laboratory by using standard method for the estimation of water, sewage and industrial waste given by APHA (1998)

Darjeeling. Radhika *et.al.*(2004) studied the abiotic parameters of a tropical freshwater Velayani lake Thiruvananthapuram, District-Kerala observed the same results as rise of water temperature in summer and low during winter.

Transparency is directly proportional to the amount of suspended organic and inorganic particulate matters. The other factors which affect the transparency of water body are plankton growth, wind velocity, rainfall, nature of water body and prevailing weather conditions. In present work the average range of transparency in the lake water was recorded between 16.65 to 41.00 cms. The minima & maxima of transparency in the lake water was recorded in the summer and winter respectively. Our result are well in agreement with Sharma and Sarang (2004) They have reported minimum transparency during monsoon and maximum during winter.

During present investigation average minimum and maximum pH value ranged between 7 to 7.15. As pH is concerned no significant variation was observed throughout the year. Pearsall (1930) and Zafar (1996) observed that the pH of water appear to be dependent upon the relative quantities of Calcium Carbonates and bicarbonates being alkaline when the quantities of Carbonates is high. The present water body being free from human interference and industrial effluents.

Dissolved oxygen is an important parameter which affects chemical as well as biological reactions in an ecosystem. The average dissolved oxygen during research work was found to be in the range of 5.40 to 10.80 mg/L. Minimum value was recorded in summer and maximum in rainy season. Similar trend of dissolved O₂ was also observed by Yeole and Patil(2005) while studying physico-chemical status of yedshi lake in relation to water pollution and Yeole and Patil(2007) while studying nutrient dependent hydro biological status of Yedshi lake, District Washim (M.S)

Carbon dioxide dissolved in water is the source of carbon that can be assimilated and incorporated into the living matter of all aquatic autotrophs (Hutchinson 1957). During present study free carbon dioxide was totally absent. The absence of the free CO₂ may be due to its complete utilization in photosynthetic activity (Sreenivasan, 1971) or its inhibition by the presence of appreciable amount of carbon dioxide in water (Sahai and Sinha, 1969). Srivastava *et.al.*(2003) also reported nil CO₂ while studying Ramgarh lake, Jaipur.

Total alkalinity is the measure of the capacity of water to neutralize a strong acid. It is generally imparted by the salts of carbonates, bicarbonates, phosphates, nitrates, borates, silicates etc. together with the hydroxyl ions in free state. During present investigation average total alkalinity was found to be in the range of 120.50 to 193.00 mg/L. The minimum value was recorded in winter and maximum in summer. Salwi (1986) and Dash (1993) studied the fluctuations in alkalinity might be due to the entry of alkaline particles through surface runoff

and low production of plankton population.

Hardness is mainly due to the percentage of calcium or magnesium salts of bicarbonates, carbonates, sulphates and chlorides. During present investigation average total hardness was found to be minimum in monsoon (Aug.2004) i.e.,98.50 mg/L and maximum in summer (May 2005) i.e., 181.80 mg/L. Our findings are well in agreement of Kaur *et.al.* (1996) The maximum value of total hardness in summer may be due to concentration of water body due to evaporation where as minimum in monsoon attributed to influx of rain water.

During present investigation average calcium hardness as CaCO₃ was recorded in range of 51.45 mg/L to 133.88 mg/L. The maximum value was recorded in May 2005 and minimum in August 2004 Sharma and Sarang (2004) studied the water sample in Jaisamand lake, Udaipur (Rajasthan) also observed similar trend in result. Calcium hardness as Ca⁺⁺ of Mohgavhan lake was found in the range of 20.60 to 53.61 mg/L. It is minimum in monsoon (August 2004) while maximum in summer (May 2005). Similar trend was observed by Kedar and Patil (2002) as well as Yeole and Patil (2007) in the water bodies of Washim District of Vidarbha region. Our results are well in agreement with the above authors.

Average Magnesium content of Mohgavhan lake was oscillated between 13.26 (Jan'05) to 41.36mg/L.(June'04) In the present investigation the magnesium content showed the direct relationship with total hardness. The similar findings was

Parameters	4-Jan	4-Feb	4-Mar	4-Apr	4-May	4-Jun	4-Jul	4-Aug	4-Sep	4-Oct	4-Nov	4-Dec	5-Jan	5-Feb	5-Mar	5-Apr	5-May	5-Jun	Min
Humidity (%)	55.25 0.11	90.6 0.09	80.6 0.03	54.6 0.07	38.2 0.07	45 0.05	45 0.05	19.5 0.05	19.5 0.05	27.4 0.05	23.8 0.05	51 0.08	53.23 0.09	23.8 0.05	27.4 0.05	26.8 0.05	23.75 0.02	23.8 0.05	23.8 0.05
Water Temperature (°C)	27 0.06	23.1 0.09	22.8 0.05	24.9 0.09	23 0.04	19.5 0.05	19.5 0.05	24.9 0.09	24.9 0.09	28.8 0.01	28.8 0.01	26.8 0.05	26.8 0.05	29.2 0.1	28.8 0.01	28.8 0.01	23.75 0.02	29.2 0.1	29.2 0.1
Transparency (cm)	17.75 0.21	18 0.22	21.9 0.11	32.3 0.4	39.8 0.06	41 0.17	41 0.17	39.8 0.06	32.3 0.4	36 0.12	36 0.12	16.65 0.2	16.65 0.2	23.5 0.23	21.6 0.21	21.6 0.21	19.13 0.18	16.65 0.2	16.65 0.2
pH	7 0.05	7 0.05	7 0.03	7 0.02	7 0.05	7 0.04	7 0.05	7 0.05	7 0.02	7 0.03	7 0.03	7 0.03	7 0.05	7 0.01	7 0.04	7 0.04	7.15 0.01	7 0.02	7 0.01
Dissolved Oxygen (mg/L)	3.9 0.045	8.3 0.045	10.8 0.03	9.4 0.06	7.9 0.06	7.7 0.008	7.7 0.008	9.4 0.06	9.4 0.06	8.63 0.013	8.63 0.013	8.63 0.013	9.84 0.019	7.88 0.009	6.1 0.002	5.4 0.003	7.3 0.006	7.3 0.006	5.4 0.003
Total Carbon dioxide (mg/L)																			
Alkalinity-T (mg/L)	163.5 0.26	162.5 0.26	157.5 0.07	169 0.29	120.5 0.03	120.5 0.32	120.5 0.32	169 0.29	169 0.29	133.5 0.35	133.5 0.35	133.5 0.35	144.8 0.39	138.2 0.47	179.2 0.42	172.4 0.38	192.4 0.42	192.4 0.42	138.2 0.3
Total Titanium (mg/L)	168 0.125	113 0.14	98.5 0.3	110 0.012	122.5 0.009	139 0.013	139 0.013	110 0.012	110 0.012	157.2 0.029	157.2 0.029	157.2 0.029	143.6 0.018	137.2 0.029	172.4 0.039	172.4 0.039	181.8 0.038	181.8 0.038	137.2 0.038
Calcium	99.2 0.165	33.5 0.075	31.43 0.06	66.68 0.011	63.53 0.031	71.4 0.011	71.4 0.011	66.68 0.011	66.68 0.011	87.15 0.058	87.15 0.058	87.15 0.058	89.04 0.037	91.34 0.028	94.92 0.03	101.71 0.03	133.88 0.036	133.88 0.036	91.34 0.028
Calcium (mg/L)	39.79 0.03	21.44 0.045	20.6 0.07	26.7 0.12	25.44 0.013	28.59 0.09	28.59 0.09	26.7 0.12	26.7 0.12	34.9 0.024	34.9 0.024	34.9 0.024	35.65 0.031	36.63 0.034	38.02 0.037	38.82 0.037	53.61 0.035	53.61 0.035	36.63 0.034
Magnesium (mg/L)	41.36 0.065	22.85 0.01	19.28 0.07	20.24 0.13	23.58 0.11	16.42 0.08	16.42 0.08	20.24 0.13	20.24 0.13	14.77 0.003	14.77 0.003	14.77 0.003	13.26 0.002	13.98 0.003	14.56 0.003	16.61 0.001	17.3 0.001	13.26 0.002	13.26 0.002
Calcium (mg/L)	26.27 0.075	12.14 0.025	17.01 0.01	17.51 0.014	14.26 0.023	16.83 0.036	16.83 0.036	17.51 0.014	17.51 0.014	23.11 0.022	23.11 0.022	23.11 0.022	26.37 0.042	31.48 0.035	35.16 0.03	38.35 0.029	19.52 0.015	12.14 0.0025	38.35 0.029
Sulphates (mg/L)	0.06 0.001	0.09 0.011	0.05 0.004	0.05 0.011	0.04 0.005	0.03 0.006	0.03 0.006	0.05 0.011	0.05 0.011	0.03 0.001	0.03 0.001	0.03 0.001	0.03 0.001	0.05 0.003	0.06 0.003	0.07 0.002	0.07 0.001	0.03 0.001	0.03 0.001
Nitrate (mg/L)	0.19 0.004	0.32 0.007	0.67 0.003	0.1 0.002	0.12 0.003	0.1 0.005	0.1 0.005	0.1 0.002	0.1 0.002	0.2 0.003	0.2 0.003	0.2 0.003	0.22 0.006	0.23 0.003	0.24 0.005	0.27 0.004	0.3 0.004	0.1 0.005	0.32 0.007
Total Phosphates	0.03 0.004	0.03 0.007	0.03 0.001	0.04 0.003	0.05 0.003	0.05 0.004	0.05 0.004	0.04 0.003	0.04 0.003	0.03 0.003	0.03 0.003	0.03 0.003	0.03 0.003	0.05 0.004	0.05 0.001	0.05 0.001	0.03 0.001	0.03 0.001	0.03 0.001
Total Solids (mg/L)	762 0.014	657.5 0.029	282.5 0.015	617.5 0.037	592.5 0.047	92.5 0.044	92.5 0.044	617.5 0.037	617.5 0.037	848.75 0.017	848.75 0.017	848.75 0.017	863.8 0.022	982.8 0.031	1009.6 0.03	910.4 0.044	1126.75 0.04	282.5 0.015	1126.75 0.04

recorded by Singhai (1986) in Tawa reservoir, Hushangabad (M.P.) and Purushothama *et.al.*(2005) while studying water quality status of Keladi Tank (Hirekere) at Sagar Taluk, Karnataka.

During the period of study the average content of chloride of the lake water was fluctuated in the range of 12.14 to 38.35 mg/L. The low Chloride content was observed in monsoon 2004 and high in summer 2005. Similar seasonal trend was shown by Ahmed and Krishnamurthy (1990) while studying the hydrobiology of Wohar reservoir, Aurangabad, Maharashtra.

The range of sulphates was found to be 0.03 to 0.09 mg/L. during investigation. In summer the values were found less and in monsoon higher value were noticed that may be due to heavy load of domestic sewage from the surrounding area into the lake (Chandrasekhar 2006)

In the present investigation nitrates varied between 0.10 to 0.32 mg/L. with maximum in monsoon 2005. Higher values of nitrates in monsoon was may be due to agriculture run off from catchment area. Ade and Vankhede (2001) recorded the maximum nitrate in monsoon while studying the limnology of Amravati University Reservoirs.

Average total phosphate ranged between 0.03 (Jun & Jul.'04) to 0.58 (Nov.'04) mg/L during present investigation. Ahmed and Krishnamurthy (1990) also recorded the peak of phosphate in winter and attributed to the large catchment area and a greater inflow of wash off from neighbouring area during rain.

During present study the average total solids ranged between 282.50 mg/L(Aug.'04) to 1126.75 mg/L (May.'05) with peak in summer and low in monsoon. This may be due to low water level in summer and high dilution of water in monsoon (Yeole and Patil, 2007)

From the above investigations, it may be inferred that the physico-chemical characteristics of present lake water varied considerably and showed characteristic trend in relation to the seasonal changes. The values obtained during the present study are found comparable to the other freshwater bodies in the state and elsewhere. All the physico-chemical parameters in general appeared to be within permissible limit according to BIS (1990, 1991 & 1993). Hence it can be presumed that the Mohgavhan lake may be suitable for drinking, irrigation, pisciculture etc.

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