

Assessment of water quality parameters of Moti lake, Motihari, East Champaran, Bihar

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ABSTRACT: Some physicochemical characteristics of Moti Lake, were investigated. Physical parameters such as colour, odour, temperature, electrical conductivity(EC), total suspended solid(TSS), total dissolved substance(TDS), turbidity and chemical parameters such as pH, alkalinity, hardness, chloride, sulphate, nitrate, fluoride, dissolved oxygen(DO), chemical oxygen demand(COD), biochemical oxygen demand(BOD), Iron, Copper & Lead and Microbiological Parameters such as total coliform & phytoplanktons were examined. Results of the study indicated that lake water is highly contaminated and not suitable for drinking purpose as it receives a large amount of raw sewage from its densely populated habitation but suitable for bathing ,aquaculture and used for irrigation.

Key words: Water Quality, aquaculture, Physico-chemical, microbiological, surface water



INTRODUCTION

Water is one of the most common and necessary resource on earth. Without water there would be no life on earth. Water is the source of all biological lives and their sustenance too. Water quality has become a major global concern due to increasing human developmental activities. Pollution is a serious problem as almost 75% of India's surface water resources have been contaminated by chemical and biological pollutants. Increase in human population creates extreme pressure on the provision of safe drinking water especially in developing countries[1] . In India river and lake pollution is very severe and critical problem due to huge amount of pollutants discharged by urban activities[2-4]. Thus, water pollution needs serious immediate action and continuous monitoring of pollution level in order to prevent the water because of its importance in maintaining the human health, plants and agriculture. Without fresh water sustainable development will not be possible. Study of physico-chemical & microbiological parameters of lake water of various sampling points have been carried out by some workers[5-7].The aim of this study was to evaluate the composition and quality of Moti lake water of Motihari, East Champaran, Bihar.

STUDY AREA

Motihari, the H.Q. of district east champaran, a well known district in state of Bihar. Motihari is divided by a Jheel (Lake) called " Moti-Jheel". There is a bridge which connects both parts of town. The govt has an ambitious plan of turning the spot into a tourist attraction by constructing a resort and a park. It also plans to introduce motorboat facilities to target tourists.The lake does not have any fresh water source. The lake suffers pollution due to domestic drainage sewers , commercial washing of cloths. The entire lake is eutrophic and its water is not suitable for drinking but can be use for bathing and fish culture.



MATERIALS AND METHODS

The methodology of proposed work purely analytical done according to the procedure recommended in APHA(1992) and NEERI (1991) guidelines[8-9] for ambient water quality. The physical, chemical & microbiological characteristics of moti lake were evaluated during pre monsoon seasons. The sampling was done from

different sampling site of moti lake. All the collected samples are immediately preserved in dark sterile boxes and processed for following different analysis.

- **Temperature:** Temperature was measured with the thermometer immersed directly in the water body, after a period of time sufficient to permit constant reading.
- **Colour:** Colour is measured by visual comparison method.
- **Turbidity :** It is determined by Nephelometer .
- **Conductance:** Conductance is the measure of salinity and measured by conductivity cum TDS meter.
- **Total Dissolved Solid:** It is determined by conductivity cum TDS meter.
- **pH:** pH value of water sample is determined by pH meter using standard buffer solution of ph 4.0,7.0 & 9.0.
- **Total Hardness :** The hardness of water body was determined as per standard methods (APHA, 1995).
- **Total Alkalinity:**Total alkalinity is analysed as per prescribed method with standard hydrochloric acid solution.
- **Chloride:** Chloride measured by titration method with standard silver nitrate using potassium chromate as an indicator.
- **Sulphate and Nitrate:**Both are determined by HACH UV-VIS spectrophotometer.
- **Fluoride:** It is measured by SPADNS method by HACH UV-VIS spectrophotometer.
- **Iron, Copper & Lead:** All these three heavy metals were analyzed by AAS.
- **Dissolved Oxygen :** The water sample was collected and Dissolved Oxygen was fixed instantly on the spot and analyzed immediately as per the Winkler’s method with Azide modification.
- **Biochemical Oxygen Demand :** The water sample was collected and incubated at 200C for 5 days (NEERI,1991).
- **Chemical Oxygen Demand :** COD was determined by potassium dichromate open reflex method.
- **Total Coliform :** It was determined by Multiple Testtube method.
- **Planktons:** It was determined by using standard method prescribed by APHA.

RESULTS AND DISCUSSION

The various physico- chemical and microbiological parameters determined for the water sample were given in Table 1,2 & 3 respectively

Table:1 Physical Parameters

Sl. No	Parameters	Unit	Permissible limit	Pre monsoon Result		Monsoon Result		Post monsoon Result	
				Mean	± SD	Mean	±SD	Mean	±SD
1	Temperature	0C	-	35.15	0.20	32.99	0.14	27.18	0.09
2	Colour	-----	-	Pale Yellow	-	Light Yellow	-	Light Yellow	-
3	Turbidity	NTU	-	4.69	0.08	5.72	0.15	5.24	0.06
4	Conductivity	µS/cm	-	784.46	0.96	674.93	0.48	815.28	0.71
5	TDS	mg/l	1500	211.65	0.67	292.0	0.0	283.50	1.87

Table:2 Chemical Parameters

Sl. No	Parameters	Unit	Permissible limit	Pre monsoon Result		Monsoon Result		Post monsoon Result	
				Mean	± SD	Mean	±SD	Mean	±SD
1	pH	----	8.5	8.05	0.06	7.44	0.07	7.66	0.08
2	Total Hardness	mg/l	-	684.51	0.93	620.96	0.60	634.56	0.94
3	Total Alkalinity	mg/l	-	681.34	0.49	725.56	0.57	674.05	0.75
4	Chloride	mg/l	600.0	195.30	0.96	156.99	0.92	177.89	0.48
5	Sulphate	mg/l	400.0	228.63	0.93	289.70	0.58	195.74	0.72
6	Nitrate	mg/l	45.0	47.81	0.38	54.77	0.47	45.34	0.45
7	Fluoride	mg/l	1.5	0.64	0.01	0.77	0.0	0.60	0.0

8	Iron	mg/l	-	Not Detected	-	Not Detected	-	Not Detected	-
9	Copper	mg/l	-	Not Detected	-	Not Detected	-	Not Detected	-
10	Lead	mg/l	-	Not Detected	-	Not Detected	-	Not Detected	-
11	DO	mg/l	5.0	6.37	0.05	5.83	0.06	7.04	0.04
12	BOD	mg/l	3.0	4.97	0.07	4.39	0.10	1.35	0.09
13	COD	mg/l	-	87.78	0.85	93.55	0.50	98.27	0.33

Table:3 Micro-biological Parameters

Sl. No	Parameters	Unit	Permissible limit	Pre monsoon Result		Monsoon Result		Post monsoon Result	
				Mean	± SD	Mean	±SD	Mean	±SD
1	Total Coliform	No/100ml	500/100ml	238	13.17	76	5.05	142	9.85
2	Planktons	No/25ml	-	450	190.05	457	187.11	446	191.46

DISCUSSION

Physical Parameters:

The temperature of the water sample is recorded highest in pre monsoon period. Colour of the water body is found to be pale yellow due to pollution. Conductance of water sample ranges from 674 to 815 $\mu\text{S/cm}$, the high conductivity may be due to contamination of conducting materials in water. Water sample of moti lake had high turbidity due to domestic n small industrial discharge , inorganic and organic matter present in the water .[10-11] Total dissolved solids (TDS) was also found high in concentration, so the moti lake water is moderately hard.

Chemical Parameters:

The pH indicates the intensity of acidity and alkalinity and measures hydrogen ions in water. Water which has pH value of more than 9 or less than 4.5 becomes unsuitable for use[12]. In the present study water is found to be slightly alkaline in nature. Total alkalinity is found not more than the permissible limits. Hardness in water is due to the natural accumulation of salts from contact with the soil and geological formations or it may be due to manmade pollutions. In the present study hardness is also found more than the desirable limits which can cause health problems[13] and so the water is not vey suitable for domestic as well as industrial purposes. Generally unpolluted water contains low concentration of chloride, but here in our study it is also little bit high in concentration. In the present study nitrate concentration is also found to be high. Fluoride , Iron, Coper & lead concentrations are within the permissible limit.

The DO level is found to be ranges from 5.83 to 7.04 because of the less effluent discharge from the industries containing high amount of organic wastes which depletes the oxygen level. It is observed from the experimental data that the COD ranges from 87.78 to 98.27 mg/L. It is the indication of toxicity present in water, which is further confirmed by high concentration of BOD[14-15] .

Microbiological Parameters :

The planktons concentrations varied from 446- 456/1 ltr of lake water. The concentration is good for commercial fish culture. Total coliform found not more than the permissible limit.

CONCLUSION

Result of the study indicated that moti lake water is contaminated and not totally safe for drinking purpose. It requires proper monitoring and environment management plans to control the release of effluents. It is suggested to provide organic fertilizers to farmers, arrange the proper drainage facility and avoid the dumping of waste in lake as it deteriorate the water the quality. It is also advised to exercise all the necessary precautions before the water is used for drinking and irrigation. Otherwise, it may cause adverse effect on the health of living beings. We should give awareness to people about the need for protecting the water reservoir from pollution. Strict legal action should be taken against those who are responsible for contamination. The observations of the biological parameters are within permissible limit and good for fish culture except the concentration of Planktons.

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