



Assessment Of Water Quality Using Physico-Chemical Parameters In Manika Mann (Lake), Muzaffarpur, Bihar

- Swati*¹ & Dr.Rakesh Mohan*²

1 Research Scholar, University Department of Zoology,

2 Professor , Department of Zoology, R.N. College, Hajipur.

B.R.A. Bihar University, Muzaffarpur, Bihar ,842001 (India).

Abstract :

Manika Mann is situated at Manika village of Mushahari Block. Its geographical coordinates are 26°7'0" North and 85°24'0" East. It is about 9 Km away from the district headquarter of Muzaffarpur. Manika Mann is perennial source of water for the local people. Local people do use the Mann water for bathing, washing, for drinking of their cattle, Irrigation and fishing. The length of the lake is about 6-7 KM while width is about 1KM. Present research was carried to study the assessment of water quality using physico-chemical parameters of Manika Mann. It was noted that temperature was minimum in 24°C in November, followed by max in 33.20°C in June. The pH of Manika Mann was varied in different season which was lowest during August month 6.78 and highest pH 8.72 in the month of June. Transparency was lowest in August 39.72 cm while highest in 60.18 cm in November month. Total alkalinity was observed lowest in October month 26.50 mg/L and highest in July 33.52 mg/L .Total dissolved substance was observed highest in july 1288.0 mg/L and lowest in November 990 mg/L. While. Dissolved oxygen was minimum observed in June 4.52 mg/L and maximum in 7.45mg/L in November. In this, all the parameters considered here shows variation in different seasons.

KEYWORDS: Dissolved Oxygen, Transparency, Total dissolved substance

INTRODUCTION:

Manika Mann is perennial source of water. So, it is significant for our environment and essential for ecological community. This is an extension of Burhi Gandak, which is not in flowing condition. Because water is stagnant and people residing either on the bank or in nearby villages use to dump different domestic wastes.

Physico-chemical analysis of pond or lake or river water quality has been done by different workers to evaluate the pollution load of the water and its effects on fix population. Some of them are being mentioned here.

Subramanian and Mahadevan (1999) studied the seasonal and diurnal variation of hydrobiological characters of coastal water of Chennai, Bay of Bengal. Gupta et al; (2001) studied hydro-chemistry of a lake of Udaipur. They analysed dissolved oxygen, free carbon dioxide, the chloride, phosphorus, nitrates, sulphates etc. and found seasonal variations in their concentrations. Dwivedi and Pandey (2002) studied two ponds at Faizabad and concluded that algal diversity of the pond depended on pH, temperature, and concentrations of different chemicals. Jha and Bharat (2003), analysed physico-chemical parameters and biological diversity of Mirik Lake, Darjeeling and concluded that lake water near the drainage had much variations in physico-chemical parameters that the water away from the drainage.

Bhuiyan and Gupta (2007) concluded physico-chemical characteristics of the pond water varied in different seasons and also due to different activities of human beings. Trivedi et al, (2009) analyzed Ganga river water at Kanpur. They concluded that all the parameters, such as pH, turbidity, dissolved oxygen revealed variations in different seasons, that there are variations in physico-chemical parameters of pond, dam, or lake water such as pH, temperature, transparency, alkalinity, dissolve oxygen, hardness, phosphorus, chloride and other chemicals in different seasons was reported by Abdullah et al; (2010); Kiran (2010), Arya et al; (2011); Ahanagar et al; (2012). We get several reports by different workers regarding physico-chemical parameters of different water bodies and all have concluded that there are variations in different parameters in different seasons and due to dumping of waste solids & liquids in the pond or lake water.

Menon et al; (2023) reviewed the physico-chemical factors and oxidative stress physiology in fish. The influence of abiotic stress such as the effects of water dissolved oxygen, temperature, salinity, water hardness, alkalinity, pH, pollutants, heavy metals and anthropogenic activities all influence the physiology, diseases, growth and reproduction of fishes. Therefore, these factors must be considered on priority basis to improve the general health and immunity status of fish. Finally, it has been concluded that environmental fluctuations occur in the aquatic environment, mainly due to abiotic stress generated by extremities in pH, salinity, temperature, dissolved oxygen and pollution load. Fish are prone to stress under climatic changing conditions. Fish are therefore, largely affected due to abiotic stress conditions in aquatic environment. It is assumed that due to this stress, globally fish production may decline by 10 % in 2050.

MATERIALS & METHOD

The study site:

Manika mann is situated in Muzaffarpur Distirct. The city lies in highly active seismic zone of India. It has an average elevation of 154 feet. The water samples for physico- chemical analysis were collected during every month from June 2023 to November 2023.

Collection of Sample:

Manika Mann water was collected between 9:00AM -10:00AM in different seasons.

Sample water was collected in plastic bottles, which were beforehand cleaned with diluted HCl followed by rinsing with distilled water. At the site, bottles were rinsed with pond water. For the analysis of dissolved oxygen sample, water was collected in a reagent bottle. The bottle was submerged in the pond water, where the cork was removed & water was collected up to full bottle. Inside the water, the glass cork was placed, so, there was no chance for the entry of air bubbles in it. With the help of pre-sterile pipette, different reagents were added to fix the oxygen present inside the plastic bottle. Then the sample water was used for titration to calculate the amount of dissolved oxygen. The pH, temperature, transparency were determined at the Manika Mann site, where as other parameters were calculated in the laboratory with the help of conductivity meter for electrical conductivity. Similarly, dissolved oxygen, total hardness, Ca hardness, Mg hardness, BOD, COD, Chloride, Nitrate, sulphate were analyzed in the laboratory following standard methods as described in the standard books like APHA. During the experiments all reagents used wee of Hi- Media products. All the experiments were done and data was tabulated in the table-1.

RESULTS AND DISCUSSION:

Selected physico-chemical parameters of Manika Mann at Muzaffarpur were studied from June 2023 to Nov-2023. The means of the data obtained were presented in table -1. Perusal of the table indicated that there were variation in pH of Manika Mann water in different months such as from June 2023 to November 2023. The maximun pH was noted in the month of June which was 8.72 followed by in the month of July which was 8.26 respectively. Here lowest pH was noted in the month of August 2023, There was no constant pattern of increase or decrease in the pH of the water of Manika Mann. Similarly, there were variations in the temperature also. It was 33.20°C in the month of June while it was 24.18 in the month of November. Here, there was gradual decrease in water temperature from June to November.

Transparency of the Manika Mann water was also determined and means of the data were tabulated in table-1. Here from the table, it was noted that minimum transparency was in the month of August which was 39.72 cm. Similarly, maximum transparency was in the month of November which was 60.18 cm respectively. So, there was gradual increase in the transparency from August to November. Total alkalinity, which is the ability of water to neutralize, the acid was also calculated by applying the methodology as described in materials and methods. Here again, there were variations in the total alkalinity in different months of the study periods. Maximum alkalinity 33.52 mg/L was measured in the month of July for the water of Manika Mann of Muzaffarpur. This was followed by 32.68 mg/l, which was noted in the month of June itself. Here minimum alkalinity was found in the month of October, which was 26.50 mg/l respectively.

Total dissolved substances were also calculated for Manika Mann water. The means of the data were tabulated in table-1. From the table, it may be noted that here also there was variations in the amount of total dissolved solutes in different months of study periods that was from June 2023-November 2023 respectively. Here, maximum amount of dissolved total soluble substances were found in the month of July, which was 1288

mg/L. This was followed in the month of June, which was 1265 mg/L. Minimum amount of total dissolved substance was noted in the month of October, which was 970.0 mg/L respectively.

Total dissolved oxygen in Manika Mann water was also calculated and means of the data were tabulated in table-1.

From the table, it was noted that the minimum amount of dissolved oxygen in Manika Mann water was found in the month of June, which was 4.52 mg/L and the maximum amount was found in the month of November, which was 7.45 mg/L. Here again, there was gradual increase in the concentration of dissolved oxygen in the Manika Mann water from June to November 2023.

DISCUSSION :

There were variations in the pH of Manika Mann water in different months of study periods that is from June to November. pH of water depends on the release of Hydrogen in water by the aquatic organisms. The phytoplanktons and blue green algae are abundant in the month of June. So they may alter the pH due to their metabolic activities. The water temperature of Lake depends on the air temperature. June is considered as the hottest month, therefore, the water temperature was highest in the month of June and lowest in November, because temperature of air falls down during this month. Transparency indicates penetration of light in the water. It depends on the quantities of suspended matters in water, because it hinders the entry path of light in water. Therefore, if there are maximum suspended particles, then low penetration, hence, less transparency. Therefore, transparency was minimum 39.82 cm in the month of August, because due to rain and run of rain water, different substances are mixed in the water body.

Alkalinity is the measure of compatibility of water to neutralize the acid. This alkalinity is due to OH^- , CO_3^{2-} or HCO_3^- . When all these are neutralized by acid, this is the total alkalinity. Here again maximum alkalinity was noted in the month of July which was 33.52 mg/L, while the minimum alkalinity was 26.50 mg/L in the month of October. This may be due to dilution of the ingredients responsible for alkalinity. Total dissolved substances also varied in different study period.

Here, maximum amount was found in the month of July which was 1288 mg/L and minimum amount was 970 mg/L in the month of October. This may be due to dilution of the water contents due to flow after rainy season. Dissolved oxygen was also calculated for the Manika Mann water. Here, ability of oxygen to dissolve in water depends on the temperature of the water bodies. As in June, the temperature is very high. So, ability of oxygen to dissolve in such water is reduced and we get lowest concentration of dissolved oxygen. The capability of oxygen to dissolve in water is directly related with water temperature. Therefore, at higher temperature there was slow concentration, which at low temperature, there was higher concentrations.

For the above, type of works, different workers have given their findings. Present findings corroborate with the findings of the following workers:-

Singh (2010); Singh et al; (2010); Singh et al; (2011); Shyamla et al, (2008); Shinde et al; (2011); Shukla (2016); Sharma et al; (2017); Sharma and Singh (2016); Ramulu and Banerjee (2013); Qureshimatva and Solanki (2015); Pathak and Mankodi (2013); Patil et al; (2012); Pandey et al (2016); Parab and Pradhan (2015).

Degradation of matter is high as most plants debris are present. But water quantity increases during summer this was also diluted therefore; the COD was reduced during monsoon and post-monsoon from 9.25 mg/L to 7.40 and 7.54 mg/L respectively.

Chloride is a common component of most waters. The chloride content fluctuates between 23.0 to 34.0 mg/L. This range is under the tolerance limit as is noted from table-2. Similar observations have been reported by Singh and Mathur (2005); Paul and Mukherjee (2006); Shyamla et al; (2008); Sharma & Capoor (2010); Hulyal and Kaliwal (2011); Madudhula et al; 2012); Mishra et al; (2013); Mol and Saji 2016). Sulphahte concentration ranged between 44.0 mg/L to 36.0 mg/L, total hardness 38.25 mg/L to 56.0 mg/L. Ca-Hardness 30.40 to 36.0 mg/L, Magnesium hardness 20.50 to 30.0mg/L, all of which are under tolerance limit.

CONCLUSION:

Physico-chemical characteristic indicates the health of Manika Mann water. It may be utilized for the management of pond water, if the mann water is heading beyond the tolerance limits. Form the present findings, quality of water may be concluded that all the parameters except pH & dissolved oxygen are under the tolerance limits of BSI.

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Table-1 Showing monthly variation in selected physico-chemical parameters of Manika Mann

Months	pH	Temp°C	Transparency (cm)	Total Alkalinity (mg/L)	Total dissolved substances(mg/L)	Dissolved Oxygen (mg/L)
June	8.72	33.20	49.65	32.68	1265.0	4.52
July	8.26	30.34	42.36	33.52	1288.0	5.61
August	6.78	29.68	39.72	28.76	1120.0	5.90
September	7.18	28.72	48.55	30.82	1015.0	6.24
October	7.88	27.50	56.24	26.50	970.0	6.78
November	7.40	24.18	60.18	27.84	990.0	7.45

Table- 2

Parametres	BSI Standard
pH	6.5 to 8.5
Total Dissolved Solid	500 mg/L
Electrical Conductivity	300 μ S/cm
Dissolved Oxygen	5-6 mg/L
Total Hardness	300 mg/L
Ca Hardness	75 mg/L
Mg Hardness	30.0mg/L
Alkalinity	200 mg/L
Chloride	250 mg/L
BOD	10 mg/L
Nitrate	45 mg/L

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