

A Study of Physico-Chemical Qualities of Muktapur Lake Water of Samastipur: North Bihar

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ABSTRACT

Lakes are important attribute of the earth's landscape by shifting of river courses which are not only the source of precious water, but provide valuable habitats to different flora and fauna. Muktapur Lakes or Maun is an important wetland near Burhi Gandak River in Samastipur District in North Bihar. It is famous in its U-shaped structure and fish production. For finding of the ecological condition of Muktapur lake a physico-chemical analysis of its water was done for two years from January 2014 to January 2016 in winter season (November to February), summer season (March to June) and rainy seasons (July to October) at 8 selected sites. Our study shows that Muktapur lake water is slightly alkaline. It is characterized by Air temperature range with 17.4–33.2°C, Water temperature range with 17.2–31.4°C, Transparency range with 15.0– 45.0 cm, pH range with 7.2– 8.3, Conductivity with 315–580µS/cm, Dissolve Oxygen range with 2.00–10.68mg/l, Total Dissolved Solid range with 192–388mg/l, Dissolved Organic material range with 2.35–5.87mg/l, Free CO₂ range with 0.0–6.7mg/l, Carbonate alkalinity range with 0.28–7.78mg/l, and Total hardness range with 157–234mg/l. Most of the Physico-chemical parameters of this lake water were found within the prescribed limits except in few cases.

Keywords: *Water Pollution, Physico-Chemical Analysis, Muktapur lake, Conclusion*

INTRODUCTION

Lakes are important attribute of the earth's landscape by shifting of river courses which are not only the source of precious water, but provide valuable habitats to different flora and fauna, relationship between species richness and productivity, reasonable hydrological cycle influence microclimate, enhance the aesthetic beauty of the landscape and extant many recreational prospects to humankind. These lakes are often categories based on the enormity of area, phytoplankton production in the different water column. Generally aquatic ecosystems often have carbon resource at their base. For example, higher trophic level production in small streams is supported by terrestrial carbon inputs and in stream benthic algal production (Wallace, J. B. and Webster, J. R. 1996), lake food supported by phytoplankton, benthic algae and terrestrial input.

Muktapur Lake is an important and one the largest ox-bow lakes of Samastipur district in North Bihar with a water spread are of 60 hectares. Locally this oxbow lake is known as Muktapur maun. It is located at Muktapur about 6 km north of Samastipur Railway Station. There is a possibility of origin of this ox-bow lake by shifting of the Burhi Gandak river. The principal features of the lake are U-shaped. Its depth varies between 2.5m-6m and mean depth 1m. The Lake is used as natural water and protein yielding resources but exploited by man at different time to meet different needs and purpose *i.e.*, drinking, bathing, washing, swimming, fishing, transporting, flushing, watering, irrigation, flowing industrial

effluents, etc. This lake through one of the arms occasionally receives the effluents from Samastipur Jute Mill. Like other aquatic ecosystem Muktapur lake is being polluted by different types of human activities. In order to determine the ecological condition of the Muktapur Lake a survey was conducted at selected sites.

MATERIALS AND METHODS

In order to determine the ecological condition of Muktapur lake, a survey was conducted at 8 selected sites *i.e.*, Site-1 Puranighat, Site-2 Pipalghat, Site-3 Pool ghat, Site-4 Asnan ghat, Site-5 Musepurghat, Site-6 Majar ghat, Site-7 Mandir ghat, and Site-8 Dhobi ghat. These sites were chosen keeping in mind pollution point of view. The distance between two sites was 25-200m. Site-1 is surrounded by agricultural field and low lands and occasionally receives the effluents from Samastipur Jute Mill. Site-2 receives the debris of decaying parts of the trees and plants. It is a dung place of cattle. Religion activities are seen there. Site-3 is near beneath the road pool. It is a place of open defecation and dumping of garbage. It also receives the fertilizers and pesticides used in the agriculture fields. Site-4 is used as a place of bathing, washing, swimming of local people. Site-5 is surrounded by dense population. It is the meeting place of household wastes, washing clothes and utensils, dumping of garbage, and open defecation. Site-6 receives the chemical effluents of bathing, washing. The debris of some sweets, fruits, candles, sticks, etc. was found emerged in water at this location. Site-7 is somewhat as like Site-6 in condition and religious purpose. Site-8 is full of many types of human activities like washing, bathing, capturing of fishes and swimming (Fig. 1 and 2).

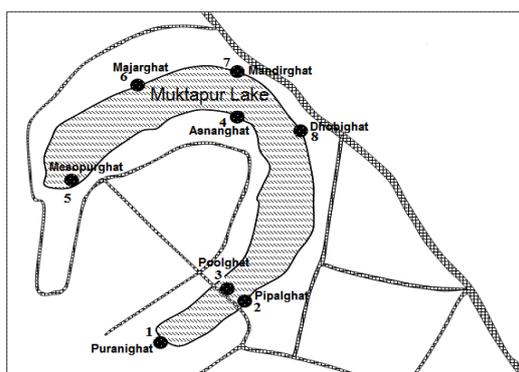


Fig.1: Selected Sites at Muktapur Lake



Fig.2: The satellite picture of lake.

For the study of physico-chemical parameters of Muktapur lake, water samples were taken from surface at the distance of 1.0-2.0 from the bank in three seasons *i.e.*, winter season (November to February), summer season (March to June) & rainy seasons (July to October) between 9-11a.m. for two years from January-2014 to January-2016. The physico-chemical analysis of the Muktapur lake water were made with references to temperature, transparency, pH, conductivity, dissolve oxygen, total dissolved solid, dissolved organic material, free CO₂, carbonated alkalinity, and total hardness. Determination of temperature, transparency and pH was done on the site and rest of the parameters were determined in the laboratory of taken water sample in polythene bottles. The physico-chemical analysis of sample was done according to standard methods (APHA, 1985).

RESULTS AND DISCUSSION

Eleven parameters of physico-chemical quality of water of Muktapur Lake at 8 observation sites were analyzed. All parameters were measured in mg/l except temperature in

°C, transparency in cm, conductivity $\mu\text{S}/\text{cm}$ and pH which has no unit. Physico-chemical analysis of its water was done for two years from January 2014 to January 2016 in winter season (November to February), summer season (March to June) and rainy seasons (July to October) at 8 selected sites (Fig. 3-5).

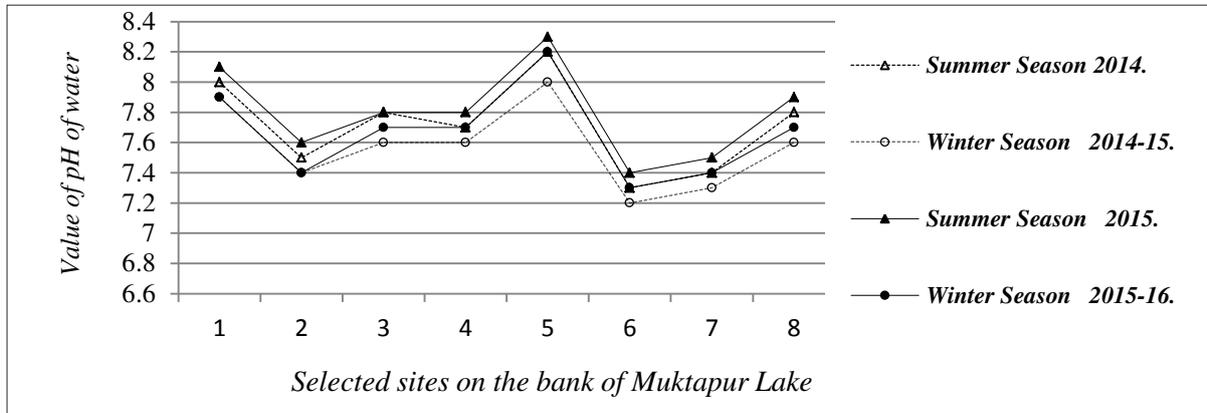


Fig.3: pH value of water

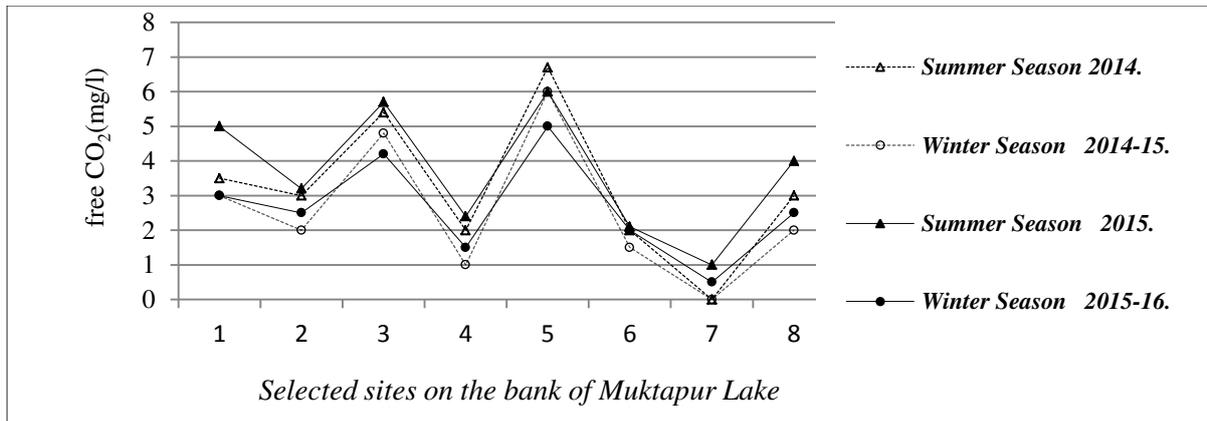


Fig.4: Free CO₂ (mg/l) of water

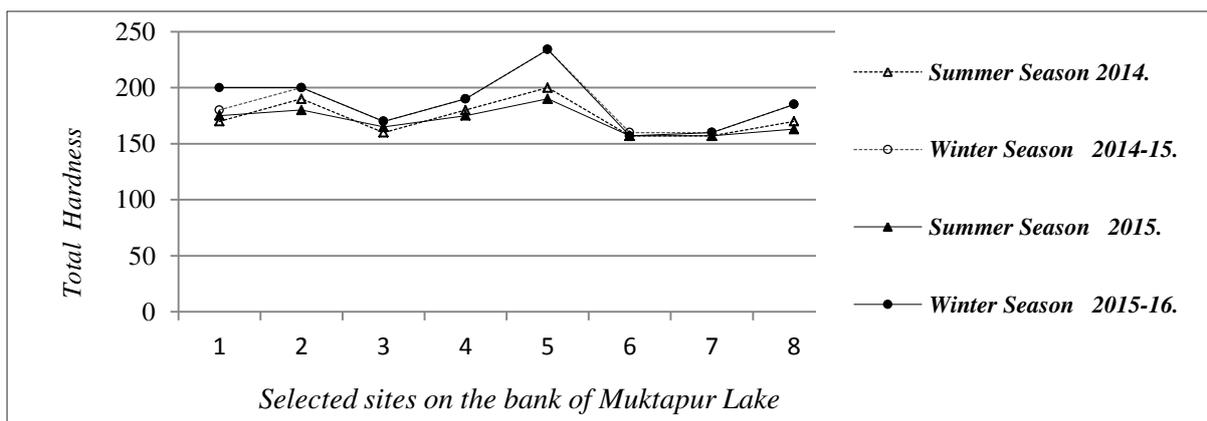


Fig.5: Total Hardness of water

Our study shows that Muktapur lake water is slightly alkaline. It is characterized by Air temperature range with 17.4–33.2°C, Water temperature range with 17.2–31.4°C, Transparency range with 15.0– 45.0cm, pH range with 7.2– 8.3, Conductivity with 315-

580 μ S/cm, Dissolve Oxygen range with 2.00–10.68mg/l, Total Dissolved Solid range with 192–388mg/l, Dissolved Organic material range with 2.35–5.87mg/l, Free CO₂ range with 0.0–6.7mg/l, Carbonate alkalinity range with 0.28–7.78mg/l, and Total hardness range with 157–234mg/l. Most of the physico-chemical parameters of this lake water were found within the prescribed limits except in few cases (Fig3-5). The present observation may be discussed in the light of previous works done by various workers. Temperature of Muktapur lake water shows a typical seasonal fluctuation as it was recorded maximum in summer (30-31.4°C) due to the temperate climate condition in confirmation with the all previous workers of temperate zone (Sharma, R.C., 1986, Bhat, A., 2002). Transparency of the lake water shows higher in the summer season than in the winter season in all observed sites. Surface run-off, water quantity and its speed are responsible for the transparency of the river water (Kumar, A. 2000). Low value of transparency causes the decline of phytoplankton density. The minimum transparency was found in rainy season. pH value(7.2–8.3) result shows that this lake water is alkaline. Conductivity of this lake water ranged between 315 to 580 μ S/cm in the whole investigation which was under potable water upper limit 1055 μ S/cm. Dissolved Oxygen ranged from 2.00–10.68mg/l during the observation period. Due to high temperature in summer Oxygen concentration was found low in comparison with winter seasons (Kumar, A. 2000). Green algae prefer with high concentration of dissolve oxygen. Total Dissolved Solids present in water was found with the range 192–388mg/l. Dissolved organic material was found high in summer season probably due to low amount of water and high amount of dissolved solutes per unit volume of water. Free Carbon-dioxide present in water was found with the range 0.0–6.7mg/l (fig-4). The presence of carbon dioxide in water explains how its content controls the concentration of carbonate and bicarbonate. At the site-5 CO₂ has been observed nearly or above 6.0 ppm which is ISI tolerance limit of free CO₂. This indicates unfavorable condition for fish production (F.A.O. 1967). Carbonate Alkalinity was found with the range 0.28–7.78mg/l. Carbonate Alkalinity was found maximum in the winter season than in the summer season in all observed sites probably due to more flow of sewage and others effluents into river water (Sharma, R. C. 1986). The condition with high value of pH, Dissolved organic material, Carbonate Alkalinity, etc will support pollution tolerant organisms *i.e.*, Leech, Worms, Dipterans etc., among benthic animals and Chlorophyceae and Cyanophyceae etc, among aquatic plants. Total hardness of the lake water ranged 157–234mg/l throughout the observation. The high prescribed limit for drinking water is 500mg/l which is far above than the observed level of total hardness.

CONCLUSION

On the basis of aforesaid discussion it may be concluded that Muktapur lake water is slightly alkaline and the sites 1, 3, and 5 are Moderately Polluted and the water cannot be used for drinking purposes. Site-5 has free CO₂ above ISI tolerant limit. This indicates unfavorable condition for fish production. Our findings will be helpful to the researchers of the present and future days.

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