Mapana J Sci, 15, 4 (2016), 49-53
ISSN 0975-3303| https://doi:10.12723/mjs.39.5

Limnological studies on Different Ponds of Bihar, India: a Review

Sumona S Das* and Sayantan D†

Abstract

Pure water is essential for human survival. The availability of good quality water is an indispensable feature for preventing diseases and improving the quality of life. So, it is necessary to know about the different physicochemical parameters of water such as, temperature, electrical conductivity (EC), total suspended solid (TSS), total dissolved substance (TDS),turbidity, pH, alkalinity, hardness, chloride, sulphate, nitrate, fluoride, dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD), nitrate and phosphate. Also Biological parameters such as planktons were examined. Results of the study indicated that the pond water of Bihar is slightly contaminated.

Keywords*:* Limnology, physicochemical characteristics, plankton.

Introduction

Water is the most vital resource for all kinds of life on this planet. With this fact at its core, concerns for the freshwater life arose in the remote past. From the time of Forel (1841 – 1912), who is regarded as the founder and father of limnology, freshwater phenomenon was observed and recorded. Limnology is the branch of science that deals with the biological productivity of inland waters with all

* Patna University, Patna, Bihar, India; sumonasanyal04@gmail.com
† Christ University, Bengaluru, India; sayantan.d@christuniversity.in

Received: August 2016, Reviewed: September 2016

the causal influences which determine it [1]. The pioneer investigations of Forel 1982 were focussed on Le Leman (Lake Geneva) where he exposed the preliminary facts concerning the fauna of freshwater. Then limnology was studied with reference to organisms, especially plankton [1]. The discovery of plankton by Victor Hansen in 1887 was an outstanding event in the field of limnology. In India, investigation by Prasad on the seasonal variation of pond organisms was conceivably the first limnological study [2].

Curiosity instigates scientists to find out the facts of limnology and hence work on different aquatic bodies have occurred occasionally. Detailed account of the physico-chemical conditions of a particular aquatic body has been given by a few some scientists, similarly, some scientists have discussed the distribution of biological conditions, and others have observed the interrelationships of these factors on the growth and development of zooplankton and fish. The researchers have also laid stress on the algal blooms [3, 4].

Physicochemical parameters: indicators of water health

Good quality of water is prerequisite for the survival of living organisms. Hence, it is necessary to check the quality of drinking water at regular interval of time, as the prolonged use of contaminated drinking water leads the human population to suffer from various water borne diseases. The quality of water deteriorates day by day because of vast population, ignorance and negligence of the human beings [1]. Quality of water can be determined by studying its physicochemical characteristics; since, environmental pollutants affect the aquatic ecosystem in a synergistic manner, the extent of pollution cannot be estimated just by relying on the physicochemical characteristics. As the biological system can combine all environmental variables over a period of time, its effects can be measured and is thus well suited for getting the gathering information regarding the level of pollution.

In this paper, both the physico chemical as well as biological parameters representing the quality of pond water of Bihar have been reviewed with work carried out in the past by scientists and academicians who have done extensive work related to the quality

of water. The physicochemical characteristics of water, that include total dissolved solids, dissolved oxygen, turbidity, temperature and hardness etc., mainly influence productivity of water. Various research works on water quality has been discussed by different researchers both from India and abroad.

Nag *et al.* [5] have analysed the physicochemical parameters of the pond Surya Kund, located in Gaya town of Bihar. Their results revealed that there was significant seasonal variation in some physico-chemical parameters and the water was moderately polluted in Surya Kund, Gaya town, Bihar. On the basis of this primary study, it was apparent that water was not potable. Total dissolved solids and total suspended solids were maximum in summer season, due to sewage water and suspended substances from the surrounding. High phosphate levels signify high degree of pollution. The value of Biological Oxygen Demand suggests that the pond is eutrophic. Increase in Chemical Oxygen Demand during summer season is correlated with the decomposition of suspended organic matter which releases the soluble organic matter in the water [5-7].

Twenty five ponds of the three blocks of Araria district, Bihar was studied from June 2011 to May 2012 by Narayana *et al.* [8]. The physical and chemical properties they studied include pH, temperature, transparency, free CO_2, dissolved oxygen, total alkalinity and total dissolved solids. They found that the pH was little alkaline and confirmed with the water quality standards given by Central Pollution Control Board, New Delhi [7]. However, level of total alkalinity increased during the rainy season. That is mainly because of the decomposition of biological organisms. The higher values of TDS during rainy season might be due to the discharge of domestic waste water and garbage etc in to the ponds. In addition, the DO values measured at different ponds were in B or C category of water quality criteria given by Central Pollution Control Board, New Delhi, indicating that water was safe for bathing and even drinking after conventional treatment [7].

Biological parameters: Indicators of water health

Rashmi[9] Analysed the seasonal fluctuations in physicochemical parameters i.e summer, monsoon and winter seasons of Moti pond of Motihari, East Chamapran district Bihar. The water parameters revealed that the pond water sample were slightly rich in nutrients with respect to phosphate, nitrate and chloride as they were found closer to their respective permissible limits. BOD of this pond was slightly high which indicated the high organic loadings. A one-year study of Moti pond made it clear that there was moderate eutrophication[9]. It is a well-known fact that the presence of phytoplanktons and zooplanktons indicate the good quality of the aquatic ecosystem. Presence of many freshwater fishes further qualifies the goodness of the water quality. As per the investigation, Moti pond showed an oligotrophic nature. The study showed the sustenance of moderate populations of planktons. The density of planktons ranged from 275 to 754. The population density of planktons was not that much high.

From the water quality assessment of two ponds in Samastipur district of Bihar, Sinha *et al.*[10] concluded that both the aquatic bodies suffered from eutrophication. High biochemical oxygen demand, low dissolved oxygen, and high nitrate concentrations indicated the eutrophic status of the water bodies. The unsuitability for the domestic use was confirmed by the higher levels of sulphates.

Conclusion

In conclusion, effects of pollution are not only devastating to human beings, but also to other terrestrial and aquatic flora and fauna. Polluted water is unsuitable for bathing, drinking, washing, recreation, and agriculture. It is a hazard to human health. This review was undertaken, mainly, to bring about an acute awareness among the people regarding the quality of water. Humans, as individuals as well as a community, can help to minimize the pollution by simple management practices and by reducing the amount of waste generated.

References

[1] P. S.Welch, *Limnology,* 2nd ed. USA: McGraw Hill Inc. 1952.
[2] V.P. Singh, "Phytoplankton ecology of the Inland waters of Uttar Pradesh," Proc. Symp. Algol. New Delhi, India: ICAR, pp.243-271, 1960.
[3] S.V. Ganapati, "Ecology of tropical waters," Proc. Symp. Alology, New Delhi, India: ICAR, pp. 204-218, 1960.
[4] V. Soni, S. Khwaja and M. Visavadia, "Pre-impoundmental Studies on Water Quality of Narmada River of India," Int. Res J. Environ. Sci., vol. 6, no. 2, pp. 31 –38, 2013.
[5] S. Shardendu, D. Sayantan, D. Sharma and S. Irfan, "Luxury uptake and removal of phosphorus from water column by representative aquatic plants and its implication for wetland management," ISRN Soil Sci., vol. 2012, pp.1-9, 2012.
[6] A.K. Nag, B. Singh and K. Gosh, "Studies Related to physico-chemical characteristics of water of Surya kund-a religious pond located in Gaya town of Bihar, India," Ultra Chem.vol. 10, no. 2, pp. 109 – 116, 2014.
[7] A. K. Dixit, S. K. Pandey, R. Mehta, A. Niyaz, Gunjan and J. Pandey," Study of physico-chemical parameters of different pond water of Bilaspur District, Chhattishgarh, India," Environ. Skeptics Crit., vol. 4, no. 3, pp. 89-95, 2015.
[8] N. Azmi, A. M. Rauf and K. Mahalaxmi, "Water quality analysis of fish pond of Araria district, Bihar," Ind. J. Appl. Res., vol. 5, no. 1, pp. 587 – 589, 2015.
[9] S. Rashmi, "Seasonal variation in physico-chemical and biological analysis of Moti Lake, Motihari, East Chamapran, Bihar," Res. J. Chem. Environ. Sci. vol. 4, pp. 56 – 61, 2016.
[10] A. Sinha, B. Kumar, T. Singh. "Water quality assessment of two ponds of Samastipur district (India)," Int. J. Environ. Sci., vol. 4, pp. 567 – 574, 2014.