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Limnological Studies On Different Ponds Of Bihar, India: A Review

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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 the causal influences which determine it. The pioneer investigations of Forel 1982 were focussed on Le Lemane (Lake Geneva) where he exposed the preliminary facts concerning the fauna of freshwater. Then limnology was studied with reference to organisms, especially plankton. 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. Curiosity instigates scientists to find out the facts of limnology and hence work on different aquatic bodies have occurred occasionally. Detailed account of the physio-chemical conditions of a particular aquatic body has been given 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.

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. 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 physio 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. have analysed the physicochemical parameters of the pond Parwati **Kund**, located in Motahari town of Bihar. Their results revealed that there was significant seasonal variation in some physico-chemical parameters and the water was moderately polluted in Parwati Kund Areraj Motihari, 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. Twenty ponds of the three blocks of East Champaran district, Bihar was studied from June 2011 to May 2012 by Narayana et al. . The physical and chemical properties they studied include pH, temperature, transparency, free CO₂, 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. 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

Materials and Methods

The water samples were collected from four different stations in the morning period around 9 to 11 am., in polythene bottle regularly for once in every month and samples brought into laboratory for the estimation of various physico-chemical parameters like water temperature, transparency, pH, were recorded at the time of collection, by using thermometer pocket digital pH meter, transparency was measured with the help of

Secchi Disc while other parameters such as TDS, DO, BOD, free CO₂, chloride, carbonate, bicarbonate and magnesium were estimated in the laboratory by using standard methods as APHA (2000) , Trivedy and Goel (1986) , Kodarkar (1992) .

Biological parameters: Indicators of water health

Analysed the seasonal fluctuations in physicochemical parameters i.e summer, monsoon and winter seasons of Parwati Kund of Motihari, East Champaran 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. 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, Parwati Kund 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 ponds in East Champaran district of Bihar,

Temperature: Water temperature of Parwati Kund was recorded maximum in month of May (summer) 34.4°C and in December (winter) 19 °C while in Parwati Kund maximum in month of May (summer) 34.1°C and in December (winter) 20 °C. Temperature is amongst one of the important factors that has direct effect over the survival and existence of living organisms as well as physico-chemical quality of water. Temperature of the pond water showed typical seasonal fluctuation as it was recorded maximum in summer and minimum in winter. Yearly mean of the temperature was observed higher in pond water during the summer but lower in winter.

Transparency-Water transparency of Parwati Kund was recorded maximum in month of May (summer) 66.5 cm and in October (winter) 45 cm while in Parwati Kund maximum in month of May (summer) 82.4 cm and in January (winter) 51.1 cm. higher transparency occur during winter and summer due to absence of rain, runoff and flood water as well as gradual setting of suspended particles. Higher transparency in winter was also reported by Bhatt et al. (1985). However, Towhead et al. (1988) observed maximum transparency during the winter. Minimum transparency was observed during the rains, has also been observed by several investigators including Bhatt et al. (1985) and Towhead et al. (1988).

PH: -Water pH of Parwati Kund recorded minimum in month of May (summer) 7.1 and in October (winter) 8.7 while in Parwati Kund minimum in month of June (summer) 7.7 cm and in January (winter) 8.4. Most commonly it varies between 7 and 9. In commonest water, pH is slightly alkaline due to the presence of bicarbonates and carbonates of alkaline earth. Seulpthorpe (1976) [13] has suggested that pH and carbon dioxide are even more critical factors in the survival of aquatic plant and fishes than the oxygen supply. Alternations in pH in natural waters are usually accompanied by changes in other physico-chemical factors

also. It is therefore very essential to monitor the level of pH in a given water body regularly in view of its implication. Its level fluctuated in within a narrow range in conformity with the findings of various workers

BOD- Biological Oxygen Demand is an important parameter for assessing water quality. When oxygen is used up faster than it is replaced, the water quality begins to deteriorate. Water BOD of Parwati Kund was recorded maximum in month of May (summer) 155.5 ppm and minimum in November (winter) 20 ppm and rainy season while in Parwati Kund maximum in month of May (summer) 125.8 ppm and in July (rainy season) 20 ppm occur during rainy season due to runoff water. The similar result also observed by Verma and Munshi (1987) and Towheed et al. (1988).

Conclusion

Conclusion Observed values of of Parwati Kund of Motihari, East Champaran district Bihar water on Temperature, magnesium, carbonate, chloride, BOD and free CO₂ were found comparatively higher than that other pound in areraj, whereas pH, Transparency, Dissolved Oxygen and bicarbonate of Parwati Kund.

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.

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