

AN ASSESSMENT OF THE PHYSICO-CHEMICAL CHARACTERISTICS OF BHAMKA POND, HANUMANA, REWA DISTRICT, INDIA

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Abstract: Present work has been conducted on Bhamka pond (a manmade pond) village Malaygawn, Block Hanumana Dist. Rewa (M.P.) India is a constructed 400 years ago with an area of about 10 acres and an average depth of 16 feet, is used by nearly 8000 local people for irrigation, fishing and domestic purposes. The variations in selected physico-chemical factors were investigated for two years to determine the water quality of Bhamka pond, for Agricultural, and Drinking and fish production. Four stations were chosen on the pond to reflect the effect of human activities, and lotic habitats. Temperature, pH, dissolved oxygen, nitrate, phosphate, biological oxygen demand, chemical oxygen demand, total alkalinity, were analyzed monthly between November 2009 and October 2010 using standard methods and procedures. Unacceptable, high levels of assessment parameters were observed in many cases for other Indian fresh water bodies except for turbidity, dissolve oxygen, Alkalinity, pH, nitrogen and phosphate which were found in higher concentration above freshwater limits. During summer season when water crisis takes place, the water shrunk to the deeper place of pond. After monsoon the water is exploited by the local people and surrounding villages for various domestic and rituals practices. The cattle's, agricultural inputs, washings and other pollution creating activities have enhanced the heavy metals and altered the physicochemical and biological characteristics of the pond water. Therefore there is a need of proper assessment, monitoring and precautionary measures to overcome the pollutant load in the pond water.

Keywords: Water quality, Bhamka Pond.

I. INTRODUCTION

The water quality in ponds, rivers and streams may vary depending on the geological morphology, vegetation and land use (modification by human activities such as agriculture, industrialization and urbanization) in the catchment. Industries, agriculture and urban settlements produce nutrients (sewage effluent and fertilizers) and toxic substances, such as organic and inorganic pollutants, and other chemicals including heavy metals. Water pollution occurs when these substances, which degrade the water quality of river, enter the waterway and alter their natural function. Where ponds and lakes have been profoundly altered and have lost much of their value, the scientific understanding of these water bodies is being used in prescribing restoration methods (Lewis, 2000).

Present study has been carried out to assess the current status of Bhamka pond used by habitants around the pond for various domestic chores. There is no available record on the physicochemical and biological characteristics of the said pond. Present study on planktonic population in relation to water chemistry will substantiate the basic information of entire ecology and the present condition of the system.

This pond lies within geographical co-ordinates of 24°18'25"12" N and 81°2'82.18"E at National Highway No.7. The pond has a maximum depth of 7m and minimum depth 2.5m. The pond receives water through surface run off during monsoon from surrounding upland and has regular inlet of sewage canal while the outlet is blocked on account of its chocking. The pond is regularly used mainly for, agriculture, bathing, washing of clothes and fishing by

the local people besides the idol immersion. This pond is also utilized for fish culture as well. Rain is the only source of fresh water for this pond.

II. MATERIALS AND METHODS

Study area:

Bhamka pond (Fig-1) situated in the Rewa district of Madhya Pradesh (India), just 9 km. from Hanumana town was selected as study area. Four sampling points were selected so as the water samples represent the entire pond. The water samples for physico-chemical analysis were collected monthly, simultaneously from all the sampling points during November 2009 to October 2010. The parameters such as pH, Temperature, Conductivity, Total Dissolved Solids, Chloride, Nitrate, Phosphate, Dissolved Oxygen, C.O.D., and B.O.D. were analyzed at the sampling spots and other parameters were analyzed in the Laboratories of the Department of Zoology, Govt. S.K.N.(PG) College, Research Centre, Mauganj, Rewa by following the standard methods as standard methods for the examination of water and waste water (APHA, 1985), practical methods in water ecology and environmental sciences (Trivedi et al., 1987) and work book on limnology (Adoni et al., 1985).



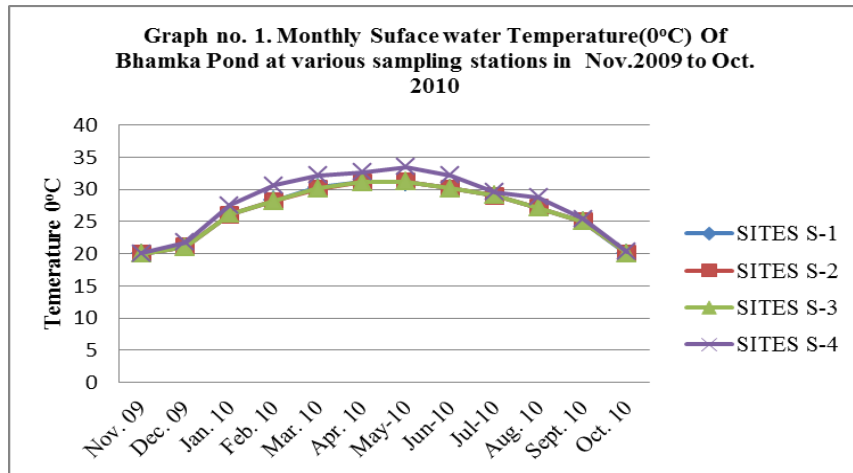
Fig. No. 1. Satellite map of Bhamka Pond Hanumana Tehsil Rewa Dist. (M.P.)

III. RESULT AND DISCUSSION

Physical parameters:

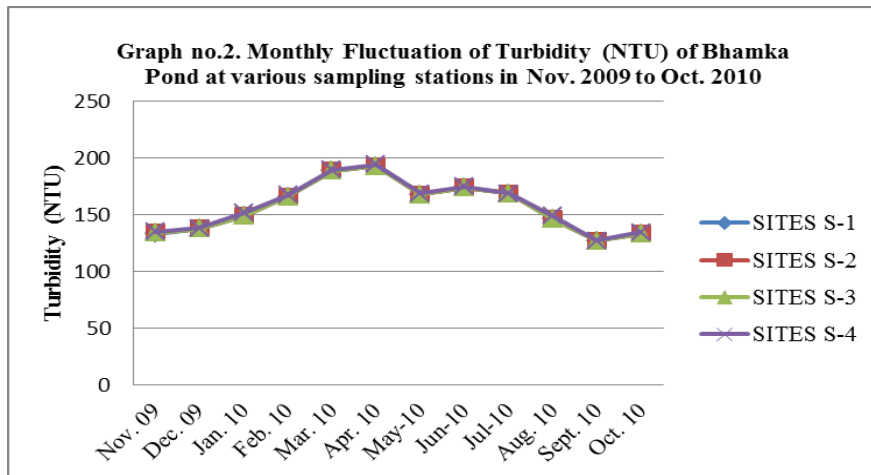
- **Water temperature:**

The average water temperature varied from 20.02°C to 31.76°C. During winter month the water temperature was found to be minimum, whereas the summer month exhibited the maximum water temperature (Graph. no.1). This investigation is also in close conformity with the finding of Kannan and Job (1979), Moundiotiya et al (2004), Mishra et al (2008), Sharma and Capoor (2010), and Arya et al (2011).



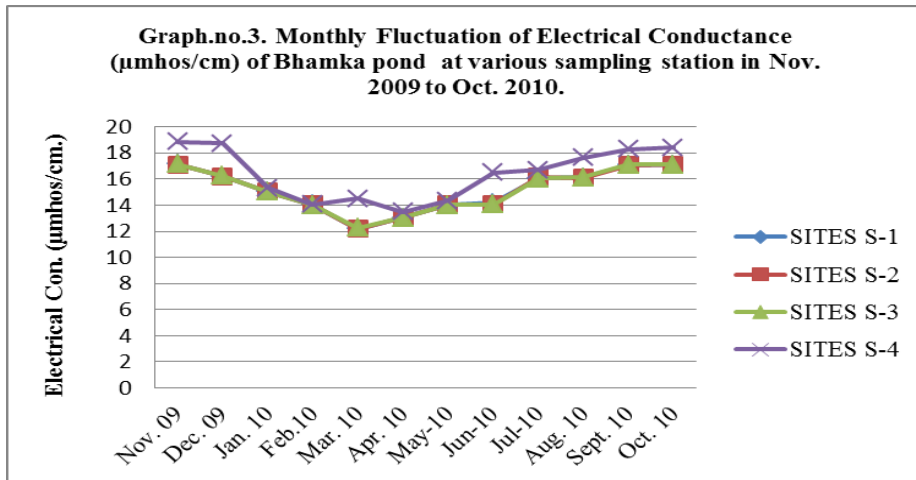
• **Turbidity-**

The turbidity was found maximum during the summer season especially in the month of April, 2010 and least turbidity was obtained in the month of September 2010 (Graph. No. 2). These results are in close conformity with the findings of Phawa and Mehrotra, 1966, Parashar et al, 2006 and Sharma and Capoor, 2010. Similar conclusion was also reported by Ashraf (1987), Ali et al (1994), Salam and Perveen (1997) and Salam et al (2000). The high turbidity during summer season might be responsible for the higher water temperature because suspended particles absorb heat from the sun light making the water warm (Thirumala et al, 2006).



• **Electrical conductivity**

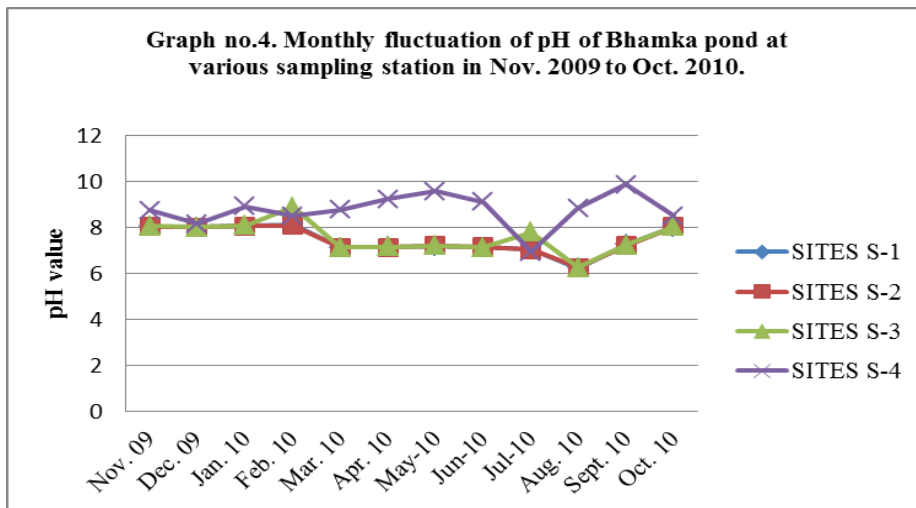
The average electrical conductivity values of water samples shows marked ranged during the course of investigation with a maximum in summer and a minimum in the winter (Graph. No. 3). The fluctuations in electric conductivity are due to fluctuation in total dissolved solids and salinity (Boyd, 1981). Ali et al (2005) also reported that Electrical conductivity of brackish water pond ranged from 12.89 (0.018) to 17.42 (0.289) ms cm⁻¹. The result also supports the findings of Moundiotiya et al (2004) and Mishra et al (2008).



Chemical Properties:

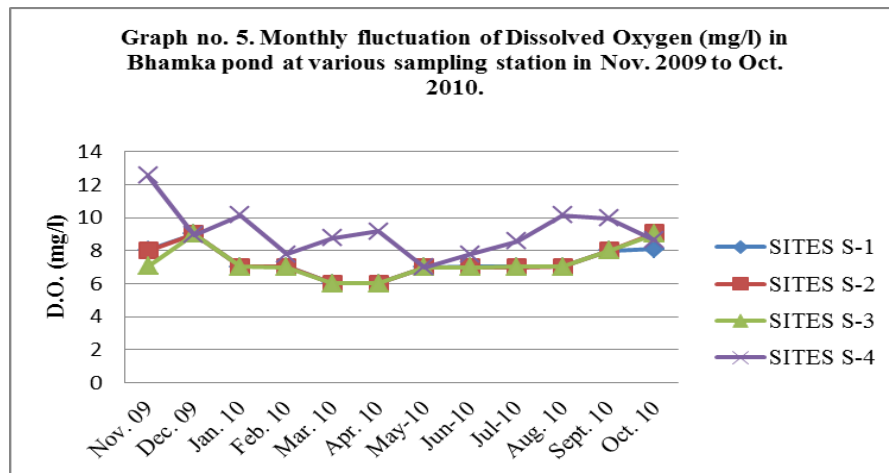
- **pH –**

The pH of water was relatively high in the winter months and low in the monsoon and summers. The average maximum values reached in February 2010 and the lowest value occurred in the month of August 2010 (Graph no. 4). The similar results were reported by Salam et al. (2000). This investigation is also in close conformity with the reports of Kannan and Job (1979), Mishra et al (2008), Sharma and Capoor (2010) and Arya et al (2011).



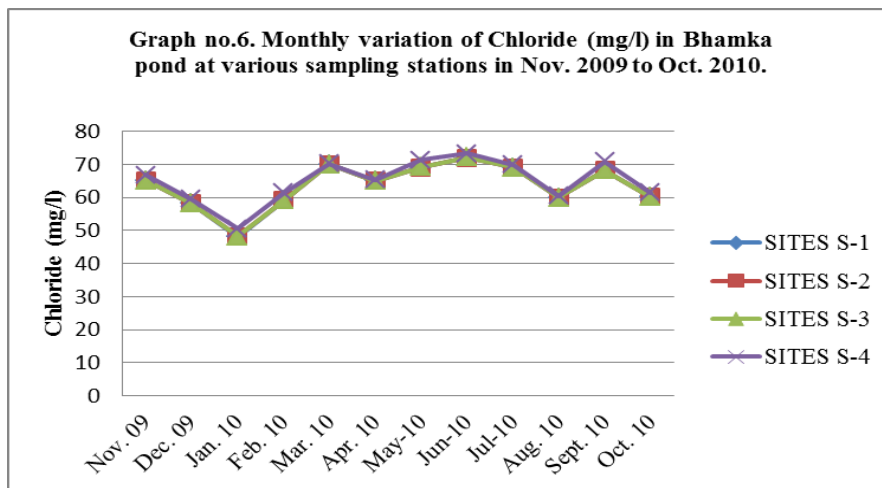
- **Dissolved oxygen (D.O.)**

The dissolved oxygen of water samples was found maximum during the winter season whereas the summer season exhibits least amount of dissolved oxygen (Graph no.5). Dissolved oxygen showed inverse relationship with water temperature (Boyd, 1981). Same results were also observed by Ali et al (1994) and Salam et al (2000).



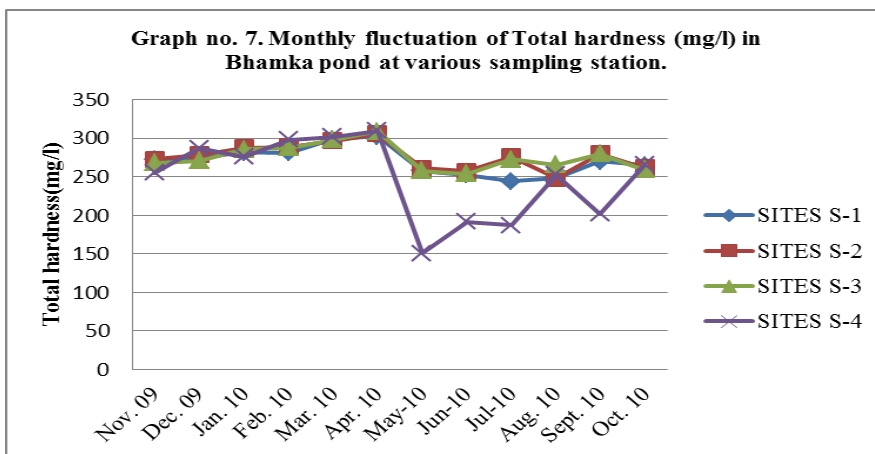
• Chloride-

The chloride content was at its peak in summer and lowers down during winter season during the course of investigation (Graph no. 6). The higher concentration of Chloride is considered to be an indicator of higher pollution due to higher organic waste of animal origin. Moundiotiya et al (2004), Mishra et al (2008) and Arya et al (2011) also reported similar results. Govindan and Sundaresan (1979); Jana (1973) observed that concentration of higher Chloride in the summer period could be also due to sewage mixing and increased temperature and evaporation by water.



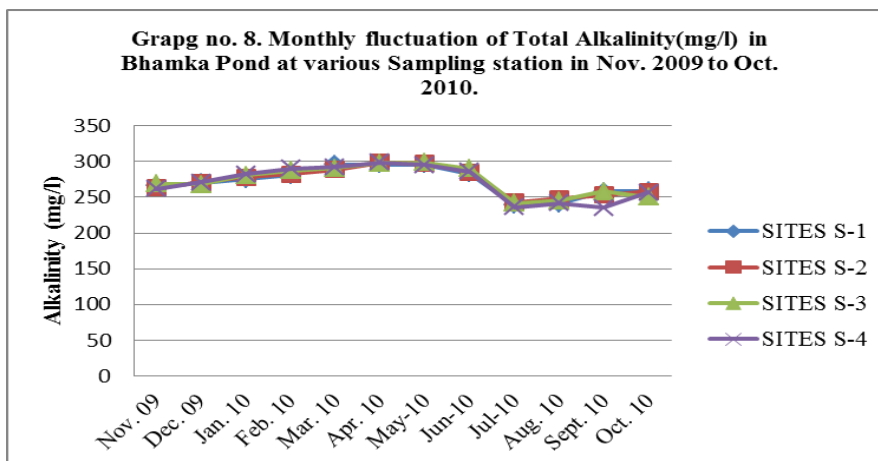
• Total hardness-

The month of April 2010 exhibited maximum total hardness and the month of May 2010 exhibited minimum total hardness (Graph no.7). The pond water is included under very hard category. Bagde and Verma (1985) suggested a similar finding about J.N.U. Lake. Khan et al., (1986) studied the hardness in different reservoirs of Bhopal during the winter season and showed that the hardness varied from reservoir to reservoir due to their geological setting.



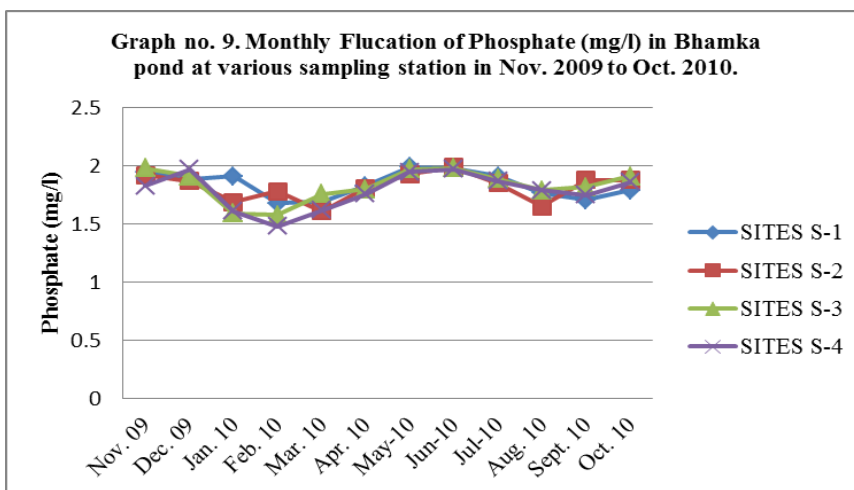
• **Alkalinity**

Alkalinity was high during the summer season followed by steep fall in the monsoon periods. The month of April 2010 shows higher alkalinity whereas the month of July 2010 exhibits lower alkalinity in the pond water (Graph no. 8). The result is also in close conformity with the findings of Mishra et al (2008) and Arya et al (2011).



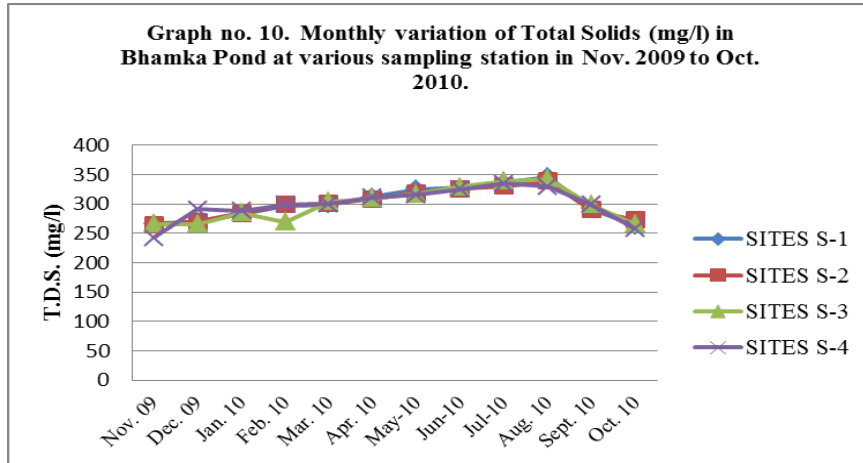
Phosphate

The value of phosphate was found maximum during monsoon and it falls down during the winter season (Graph no. 9). The study also supports the findings of Kannan and Job (1979) and Mishra et al (2008).



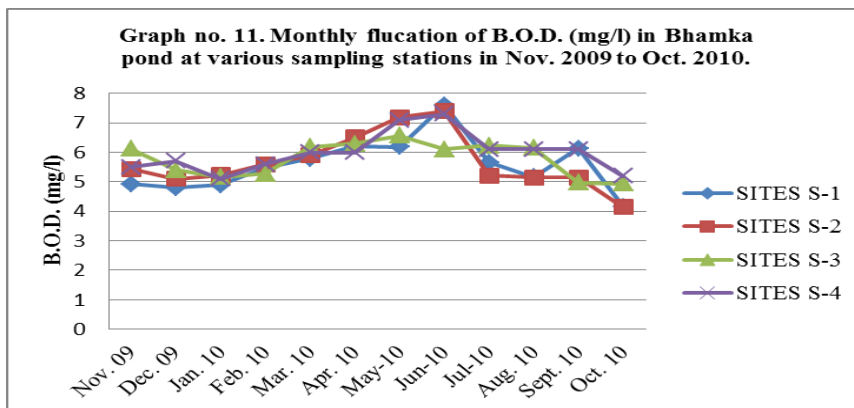
• **Total Solid**

The value of total solid was higher during the monsoon month and it decreases during winter month (Graph no. 10). These observations also supports the findings of Moundiotiya et al (2004), Salam and Mahmood (1998) Salam et al (2000) and Mishra et al (2008). According to Trivedi et al (1987) total solids in the most of the cases are organic in nature and pose serious problems of pollution.



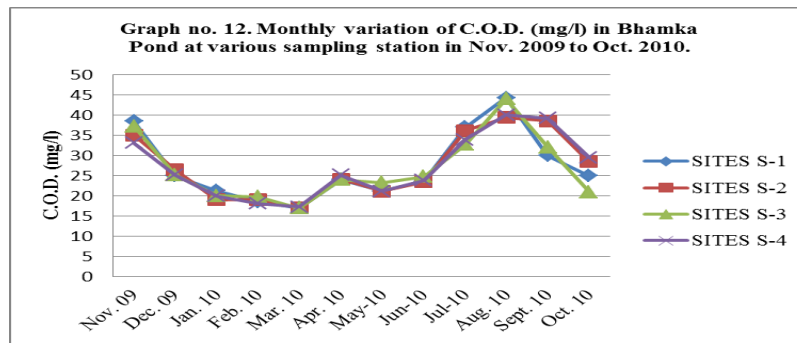
• **B.O.D.**

The B.O.D. value was reported high during summer season and minimizes in the winter season Graph no. 11). These findings are also in accordance with Ahmad(1989), Vamos(1994), Parashshar et al (2008), Sharma and Capoor (2010) and Arya et al (2011).



• **C.O.D.**

The C.O.D. value was found maximum in monsoon season and minimum during summer season (Graph no. 12). These observations support the findings of Sharma and Capoor (2010) and Tiwari (2005). The other factor responsible for increased COD concentration might be the establishment of human colonies at the bank of pond who are responsible for adding domestic sewage thus resulting in higher COD (Mohan et al, 2007 and Sharma et al, 2010).



IV. CONCLUSION

Therefore it can be concluded through this study that the age old Bhamka pond with social and cultural importance is degrading at an alarming rate. In the past two decades the pond has shown drastic changes regarding the productivity. The rapid increase of human activities and assemblage of livestock are creating pollution in the pond water and needs immediate measure. At this critical juncture the local representatives, Government and Non-Government bodies, the educated bodies, the village heads and the reputed figures of the society should come forward and formulate conservational model for the sustainability of this beautiful water body.

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