



PHYSICO-CHEMICAL STUDIES ON POLLUTION POTENTIAL OF RIVER BINA AT SAGAR (M.P.)

Chetna Muraniya

Research Scholar Department of Chemistry ,
Swami Vivekanand University, Sagar (M.P).

ABSTRACT

Present study is aimed at investigating the main factors responsible for water pollution in river Bina at Sagar. The inevitable proximity of a city/town to river would introduce the controllable and uncontrollable types of pollution sources. The controllable sources include the water carriage system of sewers and industrial waste water. An extensive research work has been reported on the effects of the municipal waste water effluents on the water quality, fish population and bottom fauna characteristics of receiving rivers. Study on hydrological status of Bina river water was made to assess the portability of water from 2015. Some physico-chemical parameters were considered such as surface water temperature, turbidity, pH, dissolved oxygen, hardness, alkalinity, phosphate and nitrate contents. Among the in this study, we tried to assess the zooplankton species richness, diversity, and evenness and to predict the state of Bina river according to physico-chemical parameters..



KEY WORDS : Physico-chemical parameters, Seasonal variation, Bina River.

I. INTRODUCTION

Nature and mankind form an inseparable part of the life support system. This system has five elements air, water, land, flora and fauna which are inter-connected inter related and inter dependent and have coevolved and are co adopted. Deterioration in one inevitably affects the other four elements. If the deterioration is for a short term and the life support system had enough resilience, it repairs itself and reverts back to the original state. However, if the deterioration continues, the whole system including all life is thrown out of gear. This disturbance of system is called pollution; this may be in air, water and land causing air pollution, water pollution and land pollution (Odum 1977, Khoshoo, 1986 and Bhargava 1987, Brima 2017).

Water is essential for the survival of any form of life. On an average, a human being consumes about 2 liters of water every day. Water accounts for about 70% of the weight of a human body. About 80% of the earth's surface (i.e. 80% of the total 50,000 million hectares in area) is covered by water. Out of the estimated 1,001 million Km³ of the total water present on earth only 33,400 km³ of water is available for drinking, agriculture domestic and industrial consumption. The rest of the water is locked up in oceans as salt-water, polar ice-capes and glaciers and underground.

The quality of river water is deteriorated because of in-stream uses of water in the following ways. During survey it was observed that rural areas are situated on both the side of Bina, which are engaged mainly in the agriculture and cattle farming. These cattle's while wading in the river transfer fecal matter and other types of pathogens in the river. Also the vigorous movement and activities of the cattle inside the

water disturb the river bed where the pollutants are settled in the form of sludge. This ultimately deteriorates the quality of the river water to a considerable extent.

Mass bathing at the banks of the Bina is performed at some places, especially during festivals, this increases the pollution load. Besides this, open defecation and cloth washing were also seen along the banks. In some cases crossing over of the river at some places through bullock carts and transporting of dung through it was also observed. All these factors either singularly or in combination increase the pollution load considerably.

The present study was made on water quality and occurrence of some respect to physico-chemical parameters in Bina River Sagar (M.P.).

II. MATERIAL AND METHODS:-

The quality of river water is deteriorated because of in-stream uses of water in the following ways. During survey it was observed that rural areas are situated on both the side of Bina, which are engaged mainly in the agriculture and cattle farming. These cattle's while wading in the river transfer fecal matter and other types of pathogens in the river. Also the vigorous movement and activities of the cattle inside the water disturb the river bed where the pollutants are settled in the form of sludge. This ultimately deteriorates the quality of the river water to a considerable extent.

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The present study conducted from 2015.

Water samples were collected monthly in the morning at 8 am to 10 am from surface layer of the dam. Physico-chemical and biological analysis of water samples were made following standard methods suggested by APHA, AWWA, WPCI (2005).

III. RESULT AND DISCUSSION:-

The data on physic-chemical analysis of Bina River has been given in table no. 1

Water temperature ($^{\circ}\text{C}$):-

During the presents study period water temperature ranged from 19.9 ± 4.61 $^{\circ}\text{C}$ to 33.4 ± 7.19 $^{\circ}\text{C}$ Jayabhaye et. al; (2006), Salve and Hiware (2006), observed that during summer, water temperature was high due to low water level and clear atmosphere. Similar results were obtained in the present study.

Turbidity (NTU):-

The turbidity values ranges from 39 ± 8.53 to 81 ± 7.39 NTU. The maximum value was recorded from rainy season and minimum in the winter season.

pH:-

The pH values ranges from 7.45 ± 0.44 to 7.9 ± 0.26 . The maximum value was recorded from Summer and Minimum in the rainy season. pH was alkaline throughout study period.

T.S. (mg/l):-

The total solid value ranges from 426 ± 4.78 to 433 ± 5.77 mg/l. The maximum value was recorded from rainy season and minimum in the summer season.

T.D.S. (mg/l):-

The total dissolve solid value ranges from 319 ± 14.63 to 365 ± 0.00 mg/l. The maximum value was recorded from rainy season and minimum in the summer season.

T.S.S. (mg/l):-

The total suspended solid value ranges from 66 ± 8.53 to 86 ± 12.50 mg/l. The maximum value was recorded from rainy season and minimum in the summer season.

Hardness (mg/l):-

The value of hardness fluctuates from 220 ± 5.77 to 227 ± 5.77 mg/l. The maximum value was recorded in the month of summer and minimum in the month of winter.

Alkalinity (mg/l):-

Total alkalinity ranges from 130 ± 8.16 to 200 ± 4.79 mg/l. The maximum value was recorded in winter season and minimum value in the rainy season.

Phosphate (mg/l):-

The value of phosphate ranged from 0.34 ± 0.02 to 0.35 ± 0.05 mg/l. The maximum value was recorded in the rainy season and minimum values in the summer. The high values of phosphate in monsoon are mainly due to rain, surface run-off, agricultural run-off; washing activities that contributed to the inorganic phosphate content. Similar results were reported by Arvind Kumar ((1995).

Nitrate (mg/l):-

The value of nitrate ranges from 0.18 ± 0.03 to 0.30 ± 0.14 mg/l. The maximum value was recorded in the summer season and minimum in the winter season. *Swaranlatha and Narsingrao (1998)* reported that nitrates are in low concentration in summer and high during monsoon which might be due to surface run-off and rain. Similar results were obtained in the present study.

Dissolved Oxygen(mg/l):-

The value of DO fluctuate from 6.70 ± 0.24 to 7.40 ± 0.39 mg/l. The maximum values were recorded in the month of winter and minimum value in the rainy season. The high DO in summer is attributed to increase in temperature and duration of bright sunlight. The long days and intense sunlight during summer seems to accelerate photosynthesis by phytoplankton's, utilizing CO_2 and giving off oxygen. This accounts for the greater quality of O_2 recorded during summer. The quantity is slightly less during winter as reported by Masood Ahmed and Krishnamurthy (1990).

C.O.D. (mg/l):-

Chemical oxygen demand (COD) value range between 36.00 ± 1.15 and 38.00 ± 2.06 mg/l. The maximum values were recorded in the month of winter and minimum value in the summer season. There

was no statistical difference in COD between the one year of study. APHA (1995), however, recommended COD levels of <2 mg/L in drinking water. High COD has been linked with pollution (Tepe et al., 2005).

B.O.D. (mg/l):-

Biological oxygen demand (BOD) value range between 5.40 ± 0.15 and 5.80 ± 0.43 mg/l. The maximum values were recorded in the month of winter and minimum value in the summer season). These findings are also in accordance with Ahmad (1989), Parashar et al (2008), Sharma and Capoor (2010) and Arya et al (2011). The heavy human settlements around the pond are responsible for adding municipal waste water thus creating organic pollution in the pond. It is also an important factor in enhancing the BOD value Sharma and Gupta (2004).

Table No. 1- Seasonal Variation of Physico-chemical parameters of water of Bina River at Sagar (M.P.)

PARAMETERS	Winter	Summer	Rainy
Temperature °C	19.9 ± 4.61	33.4 ± 7.19	31.5 ± 2.55
Turbidity (NTU)	39 ± 8.53	43 ± 7.00	81 ± 7.39
pH	7.9 ± 0.26	7.9 ± 0.26	7.45 ± 0.44
T.S. (mg/l)	426 ± 4.78	433 ± 5.77	426 ± 4.78
T.D.S. (mg/l)	362 ± 6.45	365 ± 0.00	319 ± 14.63
T.S.S. (mg/l)	66 ± 8.53	68 ± 5.77	86 ± 12.50
Hardness (mg/l)	221 ± 10.30	227 ± 5.77	220 ± 5.77
Alkalinity (mg/l)	200 ± 4.79	163 ± 5.77	130 ± 8.16
Phosphate (mg/l)	0.35 ± 0.05	0.34 ± 0.02	0.35 ± 0.05
Nitrate (mg/l)	0.18 ± 0.03	0.30 ± 0.14	0.18 ± 0.03
D.O. (mg/l)	7.40 ± 0.39	7.20 ± 1.03	6.70 ± 0.24
B.O.D. (mg/l)	5.80 ± 0.86	5.40 ± 0.15	5.80 ± 0.43
C.O.D. (mg/l)	38.00 ± 2.06	36.00 ± 1.15	37.00 ± 4.57

IV. CONCLUSION:-

Therefore it can be concluded through this study that the Bina River Sagar 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, domestic swage, industries effluents are creating pollution in the river water and needs immediate measure. At this critical time 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 natural water body.

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**Chetna Muraniya****Research Scholar Department of Chemistry , Swami Vivekanand University, Sagar (M.P).**