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Research Article

Evaluation of some Hydrobiological parameters in river Asan in Morena district

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Abstract: Industrialization, urbanization, population explosion and green revolution have deteriorated the various sources of water. The industrial effluents, sewage and polluted water from other sources when discharged into any stream or river not only cause pollution but drastically disturb the fauna & flora. The same is true for Asan River flowing in Madhya Pradesh. It, therefore, becomes a must to assess water quality of Asan at the downstream site (D) and upstream site (A) throughout its entire length in Morena district. It was since the beginning of 1970's that environmental pollution became a serious problem in India. Because of the rapid increase of population and concentration of factories around the coastal region of Asan. Significant alterations in hydrobiological parameters were observed.

Keywords: pH, Temperature, Water flow measurement, Turbidity, Colour, Odour.

1. Introduction

Sustained supply of safe and potable water is of paramount importance in the promotion of health and well-being of the people. Today world is facing a number of challenges affecting the availability, accessibility, use and sustainability of its freshwater resources.

Global studies show a challenging future and a chaotic view when considering the total use and water availability in the third millennium. According to UN estimates by 2025, the demand for fresh water will rise by nearly 60% more than is currently available. Currently, more than 1.1 billion people lack access to clean drinking water to 500 million people from India.

Water is the most vital resource for living beings because there is no life without water and cellular activities never occur. Water is essential for the socio-economic development of human beings. There is plenty of water on the earth's surface. The fresh water is however limited and a large part of it in a polluted state at present. Only 2.7% of the total global water content of approximately 1.4 billion cubic km is fresh, suitable for aquatic ecosystem.

Asan River is one of the most important rivers of Morena district. It is the biggest water collecting river in this region.

It is situated in the middle of the district from south to northeast and it is extended in Joura, Morena and south part of Ambah Tahsil. Kunwari water collecting area is situated on its west, north and northeast part and in the south part Gwalior district is situated.

On this river, from the 8 km away from Jaura, 'Pagara' dam is built which is $26^0$16' north latitude and $77^0$57' eastern latitude. Water collecting area of the river up to the dam is 518 million square meters. Its approximate monsoon flow is 122.06 million cubic meters per second. Its approximate water discharge is 1500.56 cubic meters per second.

From Morena district at the distance of 10 km on the south-east side of Kotwal gaon is located and a dam is built on this river is known as Kotwal Dam.

On the south side of Morena Tahsil another important river flows which are known as Sank River. This river is the associate river of Asan River.

Asan River is in the form of a narrow, stretched band from Pagara Dam to the south-west, but it becomes wide on the northeast side.

Kotwal Dam is the main pond of this region, which was built in 1933 on Asan River. It is connected with the Sank River by a canal and its irrigation area is 60,772 hectares.

Pagara dam was built in 1931 located on the Asan River, 10 km away from Jaura in south direction. This

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pond provides irrigation facility to Jaura and its neighbouring areas.

The water of Asan River is mainly used for agricultural purpose. Villagers from nearby areas use water for bathing, washing clothes and for waste disposal, etc. in some areas dead bodies are also drawn in this river; due to all these activities, the water of Asan River is becoming polluted. The study will deal under the following Gaon:

a. Chonda Gaon
b. Jaroni Gaon
c. Karua Gaon
d. Girgoni Gaon

Data indicate that status has been notoriously ineffective in their water management. The national ministry of environment and forests is well aware of the nexus of problems surrounding lotic habitat.

But the lotic aquatic ecosystem, particularly rivers becomes a conventional conduit for the disposal of a broad spectrum of industrial, domestic and municipal sewage containing organic and inorganic chemicals.

Aquatic organisms: Asan River is the major source of water supply for the Morena district in Madhya Pradesh, but it has been indiscriminated polluted and misused. On the bank of river Asan the crops of cucurbits cultivated by farmers for which various pesticides continuously use for pest control. This degradable and non-degradable property of pesticides seriously effects on aquatic ecosystem of Asan River.

2. Materials and Methods

2.1 Experimental Protocol

Water samples are collected from river Asan at district Morena. After each 3 months sample was collected at each sampling station at different times for the analysis of different parameters.

Samples were collected in the middle of streams and at mid-depth in the direction of flow and stored at a low temperature (4^0C). The study will be a deal under the following headings:-

1. Morena will be marked out of the inlets of the pollutants.
2. Monitoring and analysis of the river water at following sampling stations:

    a. Chonda Gaon
    b. Jaroni Gaon
    c. Karua Gaon
    d. Girgoni Gaon

2.2 Water sampling collection

Sampling was done significantly after each three-month interval for 1 year. The water samples of the river Asan were collected.

Water samples are collected from all the sampling points from October 2010 to July 2011 for the study of water quality. Samples from the river water were collected in five litres pre-cleaned plastic bottles for physicochemical analysis.

One glass bottle (DO Bottle capacity 300ml) was filled with water at every sample point for the estimation of dissolved oxygen as referred by APHA (1992). Sample for MPN (Coliform and Faecal bacteria or Coliform) detection were collected in a sterilised glass bottle and preserved in ice (APHA, 1992) water temperature was determined at the sampling point while other parameters were analysed in the laboratory.

2.3 Water quality examination

2.3.1 Physical parameters

a. Temperature: Temperature of water sample was measured by a centigrade mercury thermometer having marks from 1 to 100^0C with division calibrated for 0.1^0C.

b. Water flow measurement: A number of methods may be used for measuring the flow of the stream. The choice of methods depends largely on the affordability, but the type of local effluents also influences. For this, I used surface float method.
Procedure: It is a simple approach in which a float (Plastic ball) is thrown on the surface. The time required for a float to travel (t), a known distance (d) is observed and the average velocity is obtained by:

$$[\bar{v}] = \frac{d}{1.2t}$$

The factor 1.2 accounts for the fact that surface velocity is normally about 1.2 times higher.

c. Colour: The colour of water sample was detected by a visual comparison method. Colour of water sample was determined by the Platinum-Cobalt method, which is normally used for the preparation of colour standards, in which 1 colour unit is equivalent to the colour produced by 1.0mg/1 of platinum.
Procedure: The colour of water sample was matched with standard colour tubes by looking vertically through the tubes towards the white surface placed at such an angle that light is reflected upward through the column of liquid. In the case of colour of the sample was exceeded 700 units, the sample is diluted with distilled water. The pH of the sample was measured as the colour was highly related to pH.

Calculation:
Colour units = Estimated colour x dilution factor

d. Odour: Odour of water sample was measured as "Threshold odour number", which is equal to the dilution ratio of the sample at which the odour is just detectable. The sample was diluted with odour

free water until least perceptible odour is detected by the tester.

Procedure: The approximate range of threshold odour number (TON) was determined by diluting 200ml, 50ml, 12ml and 2.8ml of sample in a 500ml glass stopper Erlenmeyer flask to 200ml with odour free water. These flasks were then placed in a water bath at desired temperature. One blank only with odour free water was also kept. Further dilution of the sample was done on the basis of a preliminary range of odour was dilution at which odour was just detected at a particular temperature was determined. Blanks were also inserted in between the sample dilution. The flasks were allowed to smell in sequence from the least concentration of the sample to high concentration of the sample. The observations were recorded on the basis of odour that was detected in each flask.

$$TON = \frac{A + B}{A}$$

Where, A = ml sample; B = ml odour free dilution water.

When total volume was prepared to 200ml, the volume of A + B was found to be 200.

2.3.2 Chemical parameters

a. pH

b. Turbidity

2.4 Physical Analysis of Asan River Water in Morena District

2.4.1 Temperature

The temperature of water sample has been observed in degree centigrade with the help of thermometer in different four stations. However, the temperature of water of Asan River varies significantly after each three-month interval.

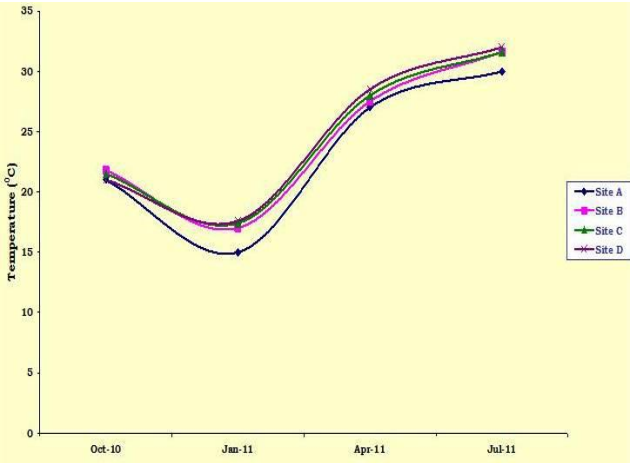

Fig. 1. Temperature of water sample at the four different stations at three-month intervals.

Table 1. Average Temperature.

Month	Temperature (°C)			
	Site A	Site B	Site C	Site D
Oct-10	21	21.8	21.5	21.0
Jan-11	15	17.0	17.4	17.6
April-11	27	27.5	28.0	28.5
July-11	30	31.6	31.6	32.0

Site A= Chonda Gaon; Site B= Jaroni Gaon; Site C= Karua Gaon; Site D= Girgoni Gaon.

2.4.2 Water Flow Measurement

The water flow measurement has been observed in different four stations. However, the flow of Asan River varies significantly after each three-month interval.

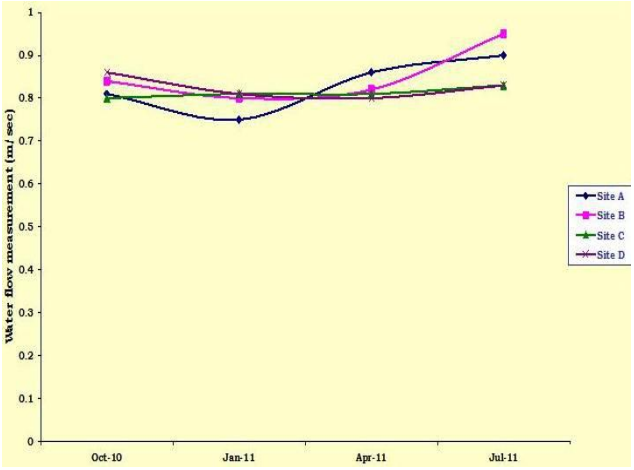

Fig. 2. Water flow measurement of water sample at the four different stations at three-month intervals.

Table 2. Water Flow Measurement.

Month	Water flow measurement (m/sec)			
	Site A	Site B	Site C	Site D
Oct-10	0.81	0.84	0.80	0.86
Jan-11	0.75	0.80	0.81	0.81
April-11	0.86	0.82	0.81	0.80
July-11	0.90	0.95	0.83	0.83

Site A= Chonda Gaon; Site B= Jaroni Gaon; Site C= Karua Gaon; Site D= Girgoni Gaon.

2.4.3 Colour

The colour of the water samples of Asan River has been observed slightly muddy of green tinge in different collecting time period as given below.

Table 3. Average Colour.

Month	Colour			
	Site A	Site B	Site C	Site D
Oct-10	Green Tinge	Green Tinge	Green Tinge	Slightly muddy
Jan-11	Green Tinge	Green Tinge	Green Tinge	Slightly muddy
April-11	Green Tinge	Green Tinge	Green Tinge	Slightly muddy

Site A= Chonda Gaon; Site B= Jaroni Gaon; Site C= Karua Gaon; Site D= Girgoni Gaon.

2.4.4 Odour

No odour of water samples has been observed from all the collecting site of Asan River.

Table 4. Average Odour.

Month	Odour			
	Site A	Site B	Site C	Site D
Oct-10	Odourless	Odourless	Odourless	Unpleasant odour
Jan-11	Odourless	Odourless	Odourless	Unpleasant odour
April-11	Odourless	Odourless	Odourless	Unpleasant odour
July-11	Odourless	Odourless	Odourless	Unpleasant odour

Site A= Chonda Gaon; Site B= Jaroni Gaon; Site C= Karua Gaon; Site D= Girgoni Gaon.

2.5 Chemical Analysis of Asan River Water in Morena District

2.5.1 pH

In Asan River water the significant variation of pH was negligible at all four sampling stations. However, the pH of water of Asan River varies significantly after each three-month interval.

Table 5. Average pH Value

Month	pH			
	Site A	Site B	Site C	Site D
Oct-10	7.10	7.27	7.32	7.82
Jan-11	7.19	7.25	7.46	7.91
April-11	7.21	7.32	7.49	7.96
July-11	7.20	7.21	7.59	7.96

Site A= Chonda Gaon; Site B= Jaroni Gaon; Site C= Karua Gaon; Site D= Girgoni Gaon.

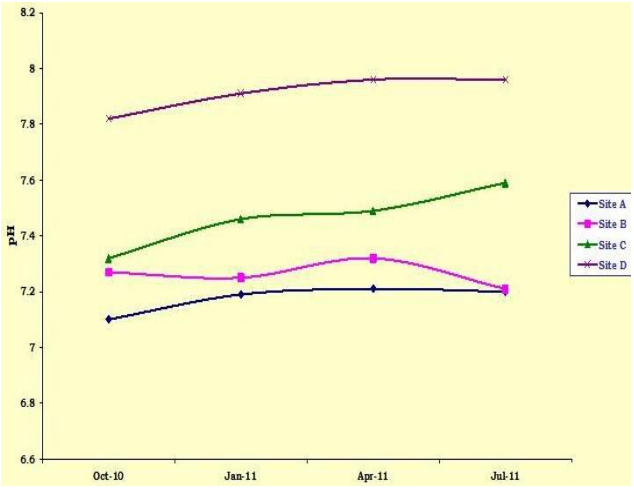

Fig. 3. pH of water sample at the four different stations at three-month intervals.

2.5.2 Turbidity

The turbidity of the water of Asan River at four different sampling stations has no significant variation. However, the turbidity of Asan water varies after each three-month interval.

Table 6. Average Turbidity.

Month	Turbidity			
	Site A	Site B	Site C	Site D
Oct-10	29	31	31	36
Jan-11	24	27	23	26
April-11	18	16	15	19
July-11	24	30	24	26

Site A= Chanda Gaon; Site B= Jaroni Gaon; Site C= Karua Gaon; Site D= Girgoni Gaon.

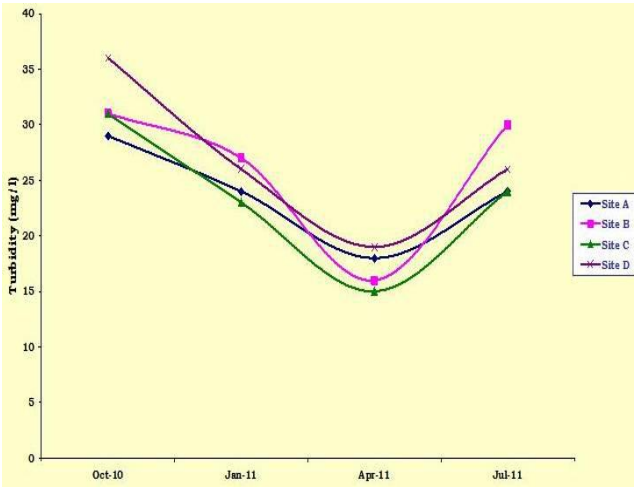

Fig. 4. Turbidity in water sample at the four different stations at three-month intervals.

3. Discussion

Water for suitable life is prime important, without water biotic activities are not possible on this planet. In nature, water occurs on the land, below its surface in the atmosphere and in the biomass. Almost all sources of fresh water, including rivers and ponds, are polluted due to urbanisation and industrialisation in the present time.

Green revolution by using pesticides, domestic sewage and industrial effluent has contributed a lot of water and soil pollution.

3.1 Physical Parameters

3.1.1 Temperature

The temperature of Asan water slightly varies at the upstream site (A) and downstream site (D) during sampling of water. Minimum temperature is recorded at the end of January 2011 while maximum in the month of July 2011 however, variation in the temperature has been recorded at three-month intervals in the present investigation. Such variation may be attributed to a lot of chemical composition due to the discharge of a major portion of the city sewage into the river which exerts influence on the river temperature. The sewage and other waste when mixed with the river water, raise the temperature of the water as it is fact that on mixing

the acidic or alkaline waste in a water body the temperature of water gets elevated.

The mean temperature for each session shows little variation from one sampling point to another. The basis of three season water temperature varies during rainy, winter and summer respectively. During summer temperature increases and in winter temperature declines, indicate that there is a reciprocal relationship between air and surface water temperature in the river. The water temperature is generally higher during the dry season. This may be due to the surface evaporation requiring heat from the water body.

The above findings are in affirmation to Pandey (1989); Gandheswary *et al*., (1990); Hasnain *et al*., (1992); Verma, *et al*., (2005) and Thakur *et al*., (2007) in river Ganga, Yamuna, river Asan and other polluted industrial belt of rivers respectively. It becomes quite clear that water quality of the upstream site (A) and downstream site (D) is different with regards to temperature parameter.

3.1.2 Water Flow Management

Water flow was maximum on July 11 at the site (A) while it was minimised on January 11 at the site (A). It may be due to the hardness and turbidity of water. Turbidity is very much responsible for the disturbed speed of water flow and weather condition.

3.1.2 Colour

The green tinge colour of Asan water samples taken during October (2010) at the upstream site (A) and slightly muddy colour of water samples taken during October 2010 at the downstream site (D) probably due to the fact that Asan River brings mud during the course.

3.1.3 Odour

The Asan water samples are odourless during October 2010 to July 2011 at the upstream site A and downstream site D respectively. This is because of a decline in the waste level in Asan and heavy discharge of domestic sewage effluents and is accordance to Sinha (1988); Manian *et al*., (1989) who observe the effects of pollutants to be responsible for such an affecting in the river Ganga and Yamuna respectively.

3.2 Chemical Parameters

3.2.1 pH

The pH value reveals a nonsignificant increase from October 2010 April 2011. But in rainy season July 2011, the river contains more water.

It reveals alkalinity but of lesser magnitude. The water samples at downstream site D reveals greater alkalinity as compared to upstream site A. such variation in pH value indicates that the level of pollution is higher and the quantity of water in Asan River is going to decline. It is the probability that the increase of pH value may be due to the outcome of mixing of sewage and other effluents in Asan River. It is supported by Mathur *et al*., (1987) and Manimegali (1990); Sunkand *et al*., (2004) and Shinde and Chaudhary (2006) to signify the pollutants which are responsible for such variations.

3.2.2 Turbidity

In the present investigation, a non-significant turbidity value has been observed between upstream and downstream sites during October 2010 to July 2011. Maximum turbidity is recorded in the month of October 2010 which may be due to the highly silted condition. An increasing rate of turbidity is recorded from April 2011 to July 2011 at the upstream site A against downstream site D.

Most probably such higher values of turbidity are due to a higher concentration of suspended solid particles, coming through the sewage system, drains as well as due to foundry wastewater. In winter season October 2004 to April 2011 turbidity has been recorded maximum due to deficiency of proper running water in the river as well as due to suspended solid particle which decreases the water flow velocity.

During summer season rate of turbidity increased, may be associated with the velocity of water flow and also due to waste pollutants of city areas.

The above finding clearly indicates that the turbidity is directly proportional to the different kinds of pollutants. The present investigation supported by Mathur *et al*., (1987); Singh *et al*., (1989); Tarzwell (1971) and Saxena and Chauhan (1993) who earlier recorded the rate of turbidity in the river.

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