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Assessment of Water Quality of Pariyat River at Panagar Region in Jabalpur city (M. P.)

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Abstract: ***Fresh water is required for healthy living. River water is used for various purposes such as drinking, bathing, irrigation etc. This natural water resource is being polluted by indiscriminate disposal of sewage, industrial waste and various human activities which affect the quality of river water. Therefore it is necessary for monitoring the water quality of river by analysis of various physico-chemical parameters of river water. The objective of this paper is to determine the physical, chemical and biological parameters of water sample and compare to the designated best use classification of streams. Pariyat River is situated near Panagar region district Jabalpur. First it meets Hiran River and then Hiran River meets to Narmada River. At Panagar region due to presence of various dairy industries situated near the bank of the river ,they directly releases the waste water coming from the dairy industries into the river water so it directly affect the water quality of river water. Organic pollution affects the organisms living in a stream by lowering the available dissolved oxygen in the water. This problem makes the river water objectionable and pollutes the water source in the vicinity of whole area.***

Keywords: BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand, DO (Dissolved Oxygen), MPN(Most Probable Number) and Designated best uses of river.

I. INTRODUCTION

Natural water bodies like rivers are subjected to pollution comprising of organic and inorganic constituent. The quality of drinking water is to vital concern for human health and life in an attempt to devise a system to study rivers in a various parts of the country is very essential (Pankaj, 2015). Water as a universal solvent has the capability to dissolve many substances including organic and inorganic compounds. This outstanding property of water can be ascertained to the inconceivability to take in water in its pure form. The quality of water generally refers to the component of water present at the optimum level for suitable growth of plants and animals. Aquatic organisms need a healthy environment to live and adequate nutrients for their growth; the productivity depends on the physicochemical characteristics of the water body (Verma, 2012). The maximum productivity can be obtained only when the physical and chemical parameters are present at optimum level. Water for human consumption must be free from organisms and chemical substances and such large concentrations may affect health (Uduma, 2014).

The pollution of water is increased due to human population, industrialization, the use of fertilizers in agriculture and man-made activity. Parameters such as temperature, turbidity, nutrients, hardness, alkalinity, dissolved oxygen, etc. are some of the important factors that determines the growth of living organisms in the water body (Smita, 2014). Water pollution needs serious immediate action and continuous monitoring of pollution level in order to prevent the water because of its importance in maintaining the human health, plants and agriculture .Hence water quality assessment involves the analysis of physico-chemical, biological and microbiological parameters that reflect the biotic and abiotic status of the ecosystem.

II. MATERIALS AND METHODS

A. Study Area

Pariyat River is a main tributary of Hiran River which is situated Imaliya near Panagar region in the district of Jabalpur. This river merges into the hiran river at Goura in an adverse condition as per pollution is concern due to presence of number of dairies near the river bank. The study area selected for the present study is village Imaliya near Panagar region Jabalpur(M.P.). The Latitude and Longitude of Paiyat River is 23°15’27’’N and 79°58’30’’E respectively. Water samples were collected from the eight different sampling locations at an approximate distance of 200m in the Pariyat river, Panagar region in Jabalpur city.

B. Selection of sample sites

The water samples were collected from eight different points of the river (shown in Figure 1).

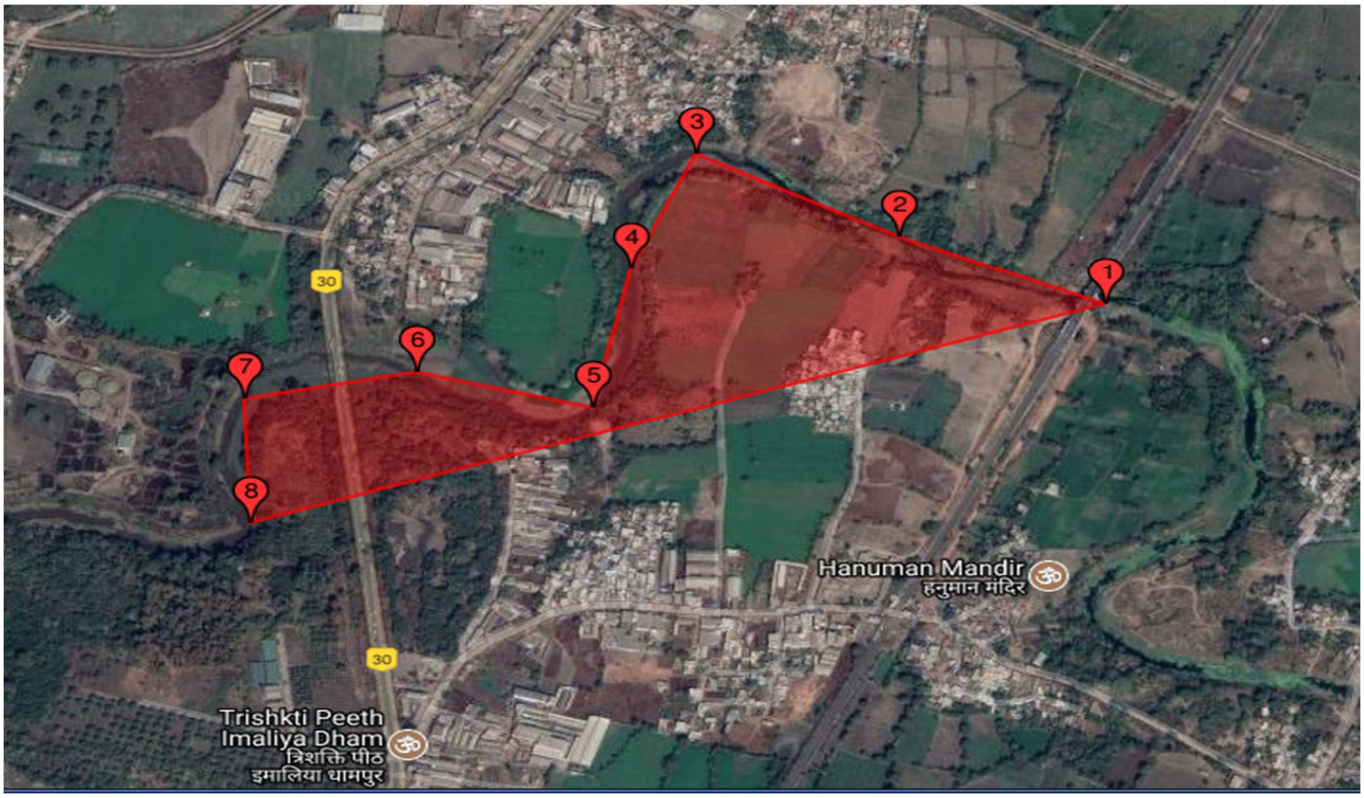

Figure: 1 Location of sampling site

Water samples are carried of 1 liter plastic bottles with stopper. Each bottle was washed with 2% Nitric acid and then rinsed three times with distilled water. BOD (300ml) and MPN bottles were used for DO, BOD and MPN test. The bottles were then preserved in a dark and clean place. The bottles were filled leaving no air space, and then the bottle was sealed to prevent any leakage. Each container was clearly marked with the name and date of sampling.

C. Water Quality Assessment

The methodology of proposed work purely analytical has done according to the procedure recommended in APHA (American public health association) and CPCB (central pollution control board) guidelines for ambient water quality. The following parameters have been considered for the water quality assessment of the river.

1) *pH:* pH value of water sample obtained by digital pH meter (shown in table 1).It can be seen the pH range varies from 7.10 to 6.57 i.e. water becomes acidic in nature due to urine of animals.
2) *Turbidity:* The turbidity of water can be related to the expression of optical property and reflects the intensity of light scattered by the particles present in the water. It has been obtained by digital Nephelo-Turbidity meter (shown in table1). It can be seen turbidity of water increase from 16.6 NTU to 37.2 NTU it means water become more turbid due large amount of mixing of organic matter and inorganic solids.
3) *Color:* Color is measured by visual comparison method. It can be seen table1 color becomes clear to dark yellow due to mixing of animals waste, domestic waste and agricultural waste. The water became foul in nature due to large mixing of organic matter.
4) *Electrical conductivity***:** Water capability to transmit electric current is known as electrical conductivity and served as a tool to assess the purity of water. It is measured by Electrical conductivity meter (shown in table 1).The electrical conductivity of water varies from 472µs / cm to 821µs / cm it means water purity of water reduces i.e. pollution level of water increases simultaneously.

5) *Chloride:* Chloride measured by Argentometric titration method with standard silver nitrate using potassium chromate as an indicator. Chloride concentrations indicate the presence of organic matter, presumably of animal origin present in the water. The chloride value varies from 23.99mg/lit to 46.98mg/lit (shown in table 1) it shows that water contain more organic matter.
6) *Total Solids:* It is determined by evaporation method. The value of solids varies from 394mg/lit to 987mg/lit (shown in table 1) it indicates the contamination of waste increases rapidly. This is main cause of an increase of pollution level of river water.
7) *Total Suspended Solids:* It is determined by filtration method and defined as the mass retained on the filter per unit volume of water. The value of suspended solids varies from 17mg/lit to 331mg/lit (shown in table 1) it represents that due to animals waste and waste quantity of suspended solids increases.
8) *Total dissolved solids:* It can be measured by subtract the total suspended solids amount into total solids. The value of TDS varies from 377mg/lit to 656mg/lit (shown in table 1). The maximum limit for TDS as suggested by W.H.O is 500mg/L which indicated that the recorded TDS signifies the polluted of river water. The contamination of domestic waste water, garbage and other related wastes in the surface water body reasons for increase in TDS measure which is responsible for high pollution of water.
9) *Biochemical Oxygen Demand:* The water sample was collected and incubated at 20°C for 5 days by using Wrinkler Method. The values of BOD obtained vary from 1.4mg/lit to 6mg/lit (shown in table1).This can be attributed to the high bacterial activity and heavy input of organic matter in the river water.
10) *Chemical Oxygen Demand:* COD was determined by potassium dichromate open reflex method. It indirectly measures the amount of organic compounds present in the water. The value of varies from 21mg/lit to 330mg/lit (shown in table 1) i.e. it has more amount of oxygen consumed for chemical oxidation of pollutants.
11) *Dissolved Oxygen:* The water sample was collected and Dissolved Oxygen was fixed instantly on the spot and analyzed immediately as per the Wrinkler's method with Azide modification. The highest amount of dissolved oxygen recorded during at initial point was 8.6mg/L because of the increased solubility of oxygen whereas the lowest dissolved oxygen at end point was recorded as 3.8mg/lit. (Shown in Table 1) this can be related to the addition of sewage, dairy wastes and drastically reduced the dissolved oxygen content.
12) *MPN (Most probable number):* It is determined by multiple fermentation technique for members of the coli form group by using Lauryl Tryptose Broth. The value of MPN varies from 47 to more than 1600 (shown in table 1) i.e. it represents the number of bacteria increases due mixing of large of organic matter waste in the river water which is not directly suitable of drinking purpose.

Table: 1 Water quality at different location (approximate @ 200m distance) of the river

S.N.	Parameter	S1	S2	S3	S4	S5	S6	S7	S8
1.	pH	7.10	7.27	7.52	6.95	6.81	6.71	6.63	6.57
2.	Turbidity (NTU)	16.6	16.9	17.3	20.3	26.8	33.1	34.5	37.2
3.	Color	Clear	Clear	Clear	Clear	Pale yellow	Pale Yellow	Dark yellow	Dark yellow
4.	Electrical Conductivity(µs / cm)	472	475	489	492	564	638	713	821
5.	Chloride(mg/lit)	23.99	24.99	27.99	28.99	29.99	31.99	35.98	46.98
6.	Total solids(mg/lit)	394	419	434	450	536	676	793	987
7.	Suspended solids	17	39	42	55	84	166	223	331
8.	Dissolved solids	377	380	392	395	452	510	570	656
9.	BOD(mg/lit)	1.4	1.9	2.1	2.5	4.0	4.6	5.5	6
10.	COD(mg/lit)	21	22	23	24	139	150	250	330
11.	DO(mg/lit)	8.6	7.4	7.2	6.5	5.1	4.3	4	3.8
12.	MPN	47	58	350	430	1600	>1600	>1600	>1600

III. RESULT AND DISCUSSION

It can be seen in the above table the water quality analysis which is conducted in different locations across the river in various physical, chemical and biological parameters shows the quality of water is not considerable for direct drinking.

Table: 2 Designated best use of classification of stream (prepared by CPCB June 2006)

Designated best uses	Classifications
Drinking water source without conventional treatment but after disinfection	A
Outdoor bathing, swimming and water contact sports.	B
Drinking water source with conventional treatment followed by disinfection	C
Propagation of wild life and fisheries	D
Irrigation, industrial cooling and controlled waste disposal	E

Table- 3 Resents the designated best Use classification of Pariyat River at Panagar region. All parameters are within the range at sampling point 1 & sampling point 2, so the quality of water is classified as 'A'. After the discharge of domestic as well as dairy waste affect the quality of river water at sampling point 3, 4,5,6,7 and 8. class of water is A which is a drinking water source without conventional treatment but after disinfection but due to continuous discharge of dairy waste water the class of water becomes E which not fit for drinking purpose.

Table-3 Designated best Use classification of Pariyat River at Panagar region

Sr. No.	Sampling point	River water quality	Remark
1	S1	A	No visible discharge of dairy waste
2	S2	A	No visible discharge of dairy waste
3	S3	B	Waste water discharge is just started
4	S4	B	Waste water discharge is increase
5	S5	C	Waste water discharge increases due to increase in number of dairies.
6	S6	D	Waste water discharge increases due to increase in number of dairies.
7	S7	E	Waste water discharge increases due to all dairies waste water meet there.
8	S8	E	Waste water discharge increases due to all dairies waste water meet there.

IV. CONCLUSION

Result of the study indicated that river water is contaminated and not totally safe for drinking purpose. It requires proper monitoring and environmental management plans to control the direct release of effluents into the river water. River water becomes highly polluted by due to the dairy waste disposal around the area which causes to change the water quality into adverse condition. It is suggested to establishment of effluent treatment plants for treatment of dairy waste water produced due to various activities. It is also advised to apply enforcement of laws against the pollution causing elements and exercise all the necessary precautions which are required for its prevention**.** We should aware the people about the need for protecting the river water from pollution. Strict legal action should be taken against those who are responsible for contamination. If it is done so this make the vicinity and standard of the areas well as increase the socio-economic condition of the living people of this area. All dairy owners must in establish the effluent treatment plant for treating the waste water generated through dairies.

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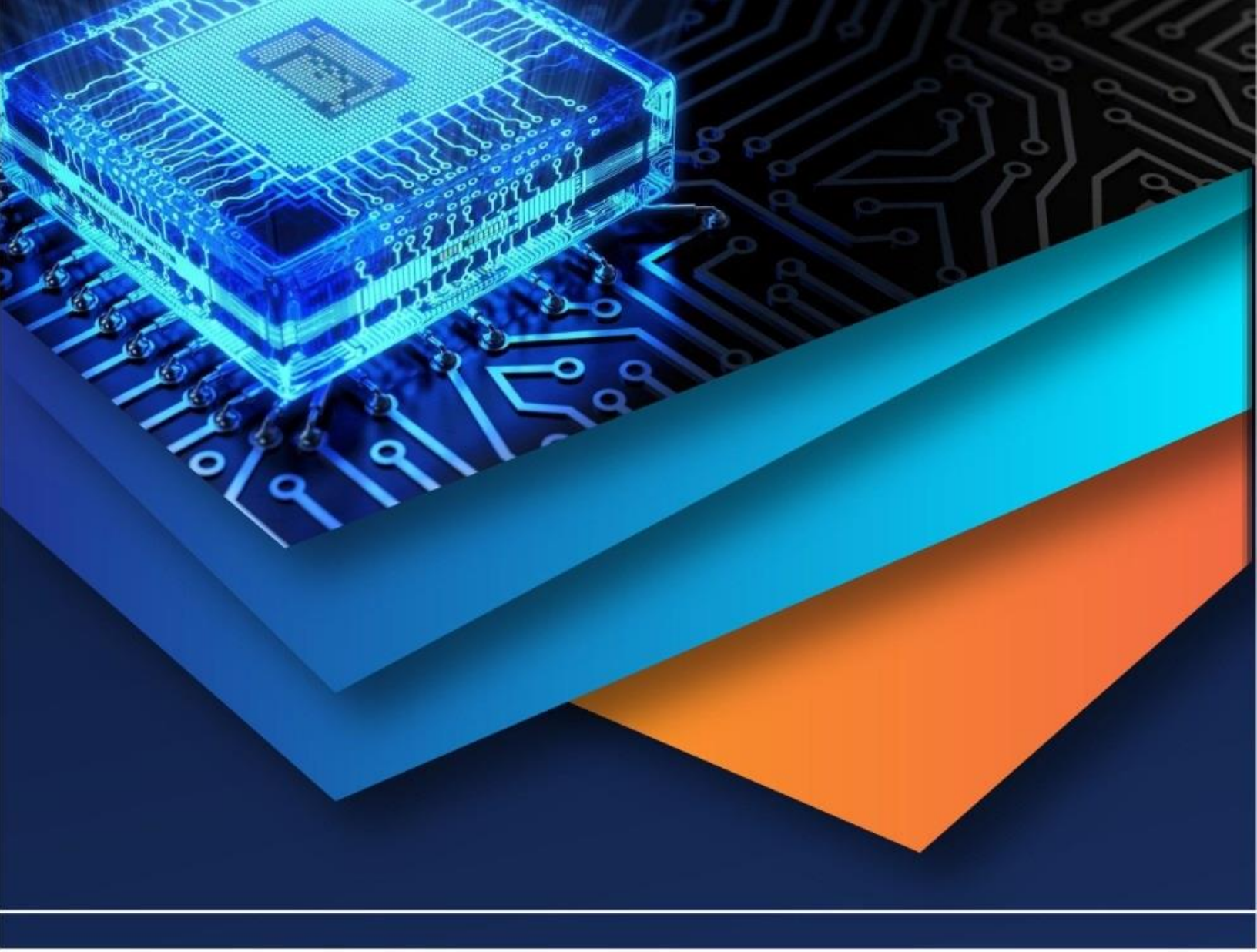

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