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STUDY OF SOME PHYSICO-CHEMICAL WATER POLLUTANTS OF KANH RIVER AT INDORE – A REVIEW

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ABSTRACT
Water is one of the most important natural resources for all the living organisms, whether unicellular or multi cellular, since it is required for their various metabolic activities. In addition, water is required for various domestic purposes, irrigation, shipping, sanitation, power generation and industries. Kanh river is the tributary of river Kshipra originates from Nimbodi talab (Latitude 22°37′29.66′′N and Longitude 75°46′86'E') near Indore meets triveni located about 6km. of the upstream of Ujjain town. It flows for a length of about 6 kms before meeting Kshipra and a heavy catchment area of about 712sq kms. This is also a non perennial river and on it two barrages viz Kayastha Khedi and Rambasa have been constructed to store the water which is mainly utilized for Irrigation purposes.The present study deals with some physico-chemical parameters namely pH, EC,TDS, turbidity, DO, B.O.D, C.O.D, TA, TH, Ca H, Mg H, Na, K, Cl and boron were determined for the testing quality at important location of Kanh river.

KEYWORDS: Water quality, Kanh River, Physico-chemical parameters.

INTRODUCTION
Water is one of the most important natural resources for all the living organisms, whether unicellular or multi cellular, since it is required for their various metabolic activities. In addition, water is required for various domestic purposes, irrigation, shipping, sanitation, power generation and industries. Water covers about three quarter of earth surface area. [1]

Water is life: It is very important that drinking water should be safe and potable. (2)Water is available from different sources which may not be always safe and available throughout the year. It was not until 1885 that people realized the significance of invisible microbial life in water. It is still a common belief that apparently clean water is safe for consumption.[3]

Taking M.P towards clean me: MPPCB is a stationary organization which was first constituted in 1974 and was entrusted with responsibility to implement the water (prevention and control of pollution) act 1974. This board has been vested with considerable authority and responsibility to control and prevent the pollution by various effluents and emissions under the water and air pollution control laws laid down from time to time. In reality M.P.P.C.B is the real machinery for implementing and enforcing the permission of various pollution control acts. M.P.P.C.B is the main objective is to maintain water air, and soil in healthy and unstable condition for various purposes. [4]

Pollution of Kanh River: The Kanh River is the main water body of the study area. The Kanh River emerging from the uphill of Kshipra starts the journey flowing through Limbodi, Teen imli, Azad Nagar, Daulatganj, finally touching Krishnapura Chhatri. (5)The level of pollution crossed the threshold after industrialization began in 60's. River Kanh is highly polluted due to the discharge of domestic waste and Industrial waste from various Industries like textile mills, chemical, pharmaceuticals, electroplating, paper mill, food processing etc located in the different industrial estate of Indore city. In monsoon, these deposits along with the agricultural runoff pollutes river Kanh and Kshipra endanger the aquatic life.[5]

LITERATURE REVIEW
The River Kanh, the tributary of river Kshipra originates from Nimbodi talab (Latitude 22°37′29.66′′N and Longitude 75°46′86'E') near Indore meets Triveni located about 6km. of the upstream of Ujjain town. It flows for a length of about 6 kms before meeting Kshipra and a heavy catchment area of about 712sq kms. This is also

a non perennial river and on it two barrages viz Kayastha Khedi and Rambasa have been constructed to store the water which is mainly utilized for Irrigation purposes. River Kanh is highly polluted due to the discharge of domestic waste and Industrial waste from various Industries like textile mills, chemical, pharmaceuticals, electroplating, paper mill, food processing etc located in the different industrial estate of Indore city. In monsoon, these deposits along with the agricultural runoff pollutes river Kanh and Kshipra endanger the aquatic life. The River Kanh is of E-quality River from the origin to confluence. Major part of the untreated domestic waste of Indore city flows into Kanh River. The River water at downstream used for growing vegetables by the Farmers, posses the risk of contaminating the food chain. Kanh River becomes dry before confluence into Kshipra. But during momsoon season its water reaches up to the Kshipra and affects the quality of Kshipra River water in the Ujjain city (M.P.P.C.B. 2012). [6]

Pollution load on Kanh River from various area of Indore city.

Sno.	Details of Kanh River	Nature of waste water
1	River Kanh at Nimvoli(origin)	Domestic
2	Azad nagar	Domestic
3	Navlakha near zoo	Domestic
4	Juni indore near burning place	Domestic
5	Pologround near bhandari mill	Domestic and Industrial
6	Bhagirathpura road bridge	Domestic and Industrial
7	Eicher Alloy	Domestic and Industrial
8	Kabit Khedi	Domestic and Industrial
9	Darjee Karadia	Domestic
10	Sanwer	Domestic

Case study
Dohare D.,Nighojkar A. (2014): In this study the research work was done on the river Kanh which is the main river of Indore city to fulfill the demand of water required. The main sources of pollution in the river Kanh is industrial, domestic and other human activities contributing to the pollution of river water. Most of the industries in Indore either small scale or large scale situated near to the bank of river which usually generate harmful waste containing so many toxic substances along with them. These wastes are directly dump in river water without any further treatment and hence causing pollution of river water and makes it unfit for drinking. The pollution of river Kanh can be protected by green cover on mountains, a channel of ponds, illegal constructions should be removed, proper drainage facility and water respiratory on the banks. The parameters observed are pH, temperature, electrical conductivity, turbidity, odor, total dissolved solids, total hardness, calcium, magnesium, BOD, nitrate, chloride, phosphate, sodium, sulphate were analyzed. The main objective of this study was to find some physico chemical water pollution parameters in Khan river for post monsoon & winter monsoon. [6]

Kumar Gupta Sanjay (2005): Studied the case study of river Gomti, where the presence of heavy metals toxified the river. The impacts of domestic/industrial wastes on the water and sediment chemistry of river Gomti with special reference to heavy metals was been investigated in different seasons (summer, winter and rainy). For this, seven sampling sites: Gaughat, Mohan Meakin, Martyr's Memorial, Hanuman Setu, Nishatganj bridge, Pipraghat and Malhaur, in the river Gomti in Lucknow region were identified and samples of water and sediments were collected in all the three seasons. In the collected water and sediment samples, six metals (Cd, Cr, Cu, Ni, Pb, and Zn) were analyzed. High concentrations of all the metals were noticed in water and sediment in rainy season compared to summer and winter. [7]

Hulya Karadede (2000): The report which showed the concentrations of heavy metals (Cd, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb and Zn) were measured in the water, sediment, and fish species from the Ataturk Dam Lake, Turkey. Among the heavy metals studied Cd, Co, Hg, Mo and Pb were not detected in water, sediments and fish samples, while Ni was undetectable levels in fish samples. Levels of Cu, Fe, Mn and Zn varied depending on different tissues. The results of this study indicated that a general absence of serious pollution in the dam lake is due to heavy metals.[8]

Latha et al. (2009): This study deals with the physico chemical parameters like pH, alkalinity, electrical conductivity (EC), total hardness (TH), calcium, magnesium, sodium, potassium (K), iron (Fe), chlorides, sulphates, phosphates, fluorides, total dissolved solids (TDS), magnesium hardness, carbonates and bicarbonates

are analyzed. All these parameters were then compared with the guidelines suggested by the Bureau of Indian Standards (BIS, 2003). Most of the ground water samples which were analyzed showed that the ground water is under hard water category and therefore remains unfit for drinking. Sampling of ground water was done in the month of May during the year 2005. The samples were analyzed for various water quality parameters by adopting APHA standards. Some of the samples are showing high TDS value which are mainly due to the seepage of surface water from the open drains in the study area. This study would helpful to local authorities for taking remedial measures to control the ground water pollution. [9]

Puri et al. (2015): Worked on the application of water quality index (WQI) for the assessment of surface water quality (Ambazari Lake). The present study aims at assessing the water quality index (WQI) in the surface water (Ambazari Lake) situated in Nagpur city, Maharashtra India, by monitoring five sampling locations within the lake (viz. Inlet1,inlet2,centre,corner and outlet) for a period of 3 months. It is apparent from WQI values that Ambazari Lake water with WQI values ranging from 42.28 to 49.84 (pre-immersion period), 58.57to 109.66 (immersion period) and 55.19 to 62.74 (post immersion period) falls under simply good to poor water category. [10]

Shivasharanappa, Padaki Srinivas and Mallikarjun S Huggi (2011): Carried out Ground Water quality characteristics and Water Quality Index at Bidar city in Karnataka (India). The study deals with assessing the water quality index (WQI) for the ground water of Bidar city and its industrial area. The groundwater samples of all the 35 wards were collected and subjected for a comprehensive physico-chemical analysis. For calculating the WQI, the following 17 parameters have been considered viz., pH, total hardness, calcium, magnesium, chloride, nitrate, sulphate, total dissolved solids, iron, fluoride, sodium, potassium, alkalinity, manganese, dissolved oxygen, total solids & Zinc.[11]

Water pollution parameters
Physical and mechanical
The characteristics which render the stream water unacceptable to physical senses are included in this group. Some of the common and important characteristics are enumerated here under:
1) Temperature: besides the physical stream caused by it also affects the solubility of oxygen in the water. Thus in its own turn affects the life of the water bodies. At 20degress the maximum solubility is 9.2 mg/l of oxygen. The same at 40degres is reduced to 6.6mg/l. The depletion of oxygen is further attenuated at higher temperature due increased microbial activity. The reduced oxygen in the water affects the adversely the flora and fauna growing on them.
2) pH: The value indicates the ionic equilibrium. It indicate the acidic or alkaline nature of water. Certain factories emit acidic and other discharge alkaline effluents. Each natural water has a capacity to resist the input of acid and alkali. This is known as buffering capacity. This does not allow change in the pH of the water. If the condition of acid and alkali beyond the buffering capacity. The pH of the water body changes. The change in the pH affects the life of the biota and the availability of the certain ions.
3) Turbidity: The clarity of water is important in producing the product design for human consumption and in many manufacturing uses. The clarity of natural body of water is major determinant of the condition.
4) Dissolved Oxygen: The DO levels in natural and wastewater depends on the physical chemical, and biochemical activities in the water body. The analysis for DO is a key test in water pollution and waste water treatment process control.
5) Suspended Solids: heavy infestation of suspended and floating material make the look of streams and lakes highly rough and untidy. The anaerobic condition develops where there is preponderance of organic matter in it.[12]

Chemical and inorganic
The changes brought in chemical characteristics through the domestic and industrial effluent cause pollution. It can thus be used as parameter to indicate the pollution.
1. Alkalinity: the alkalinity of water is its acid neutralizing capacity. Alkalinity is a measure of an aggregate property of water. Alkalinity of many surfaces water is primarily a function of carbonate, bicarbonate and hydroxide content, it is taken as indication of concentration of these constituents. [12]

Organic and nutrient
Naturally flowing waters have usually very little number of organic matters in them. The excess organic matter in these water indicates the discharge of sewage or industrial effluents on them.

- BOD: The organic matter present in water utilizes the DO of the water for its decomposition. This depletes the oxygen and hence make it difficult the biota to live in healthy loaded water bodies. This is measured by the assessing the amount of oxygen utilized in oxidation of organic matter through biological means when the same is incubated at 20 degrees for 5-days.
- COD: when all the oxidizable matter present in water is oxidized by the oxygen evolving from dichromate it provides the estimate of chemical oxygen demand.
- Nitrate: Presence of nitrogenous compound promote the growth of biota & causes Eutrophication. It is time used as indication of pollution.
- Phosphate: It is not also the normal ingredient of surface water. The introduction of this element in the water insoluble from causes algal bloom and leads to Eutrophication. It is time used as indication of pollution.
- Oil & Grease: Certain constituents measured by the oil and grease analysis may influence waste water treatment systems if present in excessive amount, they may interfere with aerobic and anaerobic biological processes and lead to decreased waste water treatment efficiency. [12]

METHODOLOGY

The methodology adopted for the overall investigations include the preliminary survey about the sampling locations. The sampling sites are fixed according to the source of active pollutants, the flow pattern and the available of detectable physico-chemical parameters. The location of the sampling sites are finalized first according to the pollution sources. The River stretch which is passing from various domestic and Industrial areas has a mixture of both wastes. Five stations are finalized for the sampling. The sampling stations are Industrial, domestic, and also comprise a treatment plant. Grab sampling is been done for the stations and the samples are collected and processed

S.No.	Parameters Analyzed	Instrument Used	Ref. of Methodology
1.	pH	Digital pH meter	Operation Manual of Instrument
2.	Turbidity	Digital Naflo Turbidity meter	Operation Manual of Instrument
3.	Suspended solids	Filter and oven	Manual(1982) NEERI
4.	Temperature	Portable kit	Operation Manual of Instrument
5.	TDS	Digital TDS meter	Operation Manual of Instrument
6.	Total Solids	Filter and Oven	Manual (1982) NEERI
B	**Chemical**		
1.	DO	Titration	Standard method 1982 published by APHA
2.	COD	DR-2010 Spectrophotometer	Operation Manual of Instrument
3.	BOD	BOD incubator	Manual (1982) NEERI
4.	Alkalinity	Titration	Physicochemical examination of water, sewage and Industrial effluent by N. Manivaskam.
5.	Nitrate	DR-2010 Spectrophotometer	Operation Manual of Instrument
6.	Total Phosphate	Spectronic-21	Operation Manual of Instrument
7.	Oil and grease	-	Standard Method (1986) published by APHA

CONCLUSION

1. The concentration of various physico-chemical pollutants is high during initial high flows of monsoon.
2. The water of River Kanh in its stretch is suitable for Agricultural purposes which can provide primary treatment to raw water.
3. Rambasa and Panthpipliya sites are found suitable for agricultural due to high value of water quality index as such suitable sewage farming utilities can be planned.

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