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Original Article

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Variation in Physicochemical Parameters of Kunda River in Khargone Region

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Abstract

Water is essential for life and plays a vital role in living organisms. The location for the collection of sample water was decided on basis of the pollution load at a particular site. Fivelocations were selected in the Khargone region for collection of sample water. The observed range of pH was 7.2 to 8.3, and Ammonia content in water varied from 0.3 to 0.74, which is higher than the considerable level as per the BIS standard. The toxic metals such as Arsenic, Mercury, and Lead contained in water were within the permissible range. The range of parameters BOD was 2.1 to 4.7. and Nitrate content varied from 23 to 28 mg/l. Physical and chemical parameters were higher than the permissible range that was categorized as non-satisfactory as per CPCB.

Keywords: CPCB, BOD, BIS, pH, WHO, Kunda River

Introduction

The Kunda river is the lifeline of Khargone district and a tributary of the Narmada river. Kunda river originates from Satpura range which is located on south west side of Madhya Pradesh and cover 40 km approximately and finally join Narmada river. Water is mainly used for agriculture, which is increasing day by day. The river water is classified in the B category. The main reason the location across the river was selected for the collection of samples was the sampling location. Today's surface water is highly polluted due to the disposal of municipal waste without treatment. Due to contamination, the ecosystem of the water is disturbed, and changes in parameters occur. Most cities, like Khargone, are situated on the banks of rivers, so pollution increases due to urbanization and an increasing population. The pollution of surface water is a sensitive environmental issue that creates problems for achieving the goal of sustainable development. Many human activities either directly or indirectly affect the quality of river water. Domestic and industrial influences contain various chemicals, such as detergent acid, organic waste surfactant, etc., that contaminate the river water. Water bodies play an important role in the civilization of human society by fulfilling the requirement for water for consumption purposes. The rate of flow of water decreases due to pollution of the river. River Kunda covers some parts of cities and fills the demand for fresh portable water. Many countries in the world successfully manage the quality of river water by using the recycling method and providing the water for public use up to WHO standards. Government measures are being improved to reduce the level of pollution in river water and also apply control policies by the MPPCB. (Solanki A. and Bhatia,2022)

The analysis of physical and chemical parameters such as BOD temperature, ammonia, etc. is to determine the quality of water as per WHO and BIS standards to manage water for the population of the town. The DO level of water indicates the health of water by supporting aquatic and human life after participating in biological activity, so high values of BOD and low values of DO are dangerous for aquatic life and decline the quality of water. The aim and objective of current work are to assess the parameters of the Kunda River by analyzing the physical and chemical qualities of the water using advanced instruments.(Solanki B. and Dwivedi, 2020)



Materials and Method:

Kunda river study area originated from Amba forest and Sirvel village and lies between longitude $75^0$36'4"E and latitude $21^0$49'16"N. the length of river Kunda is approximately 169km. River Kunda flows from south to north through four blocks of Khargone district. All domestic wastes and raw sewage are directly dump in to river due to urbanization and population load. Four sampling sites were selected in the river as shown in figure 1.

Determination of Physicochemical Parameters:

The sample of river water were collected from all selecting sites. The sites for sample collection are followsVanihar Stoppage Dam, Ganesh Temple, Town Bridge, Sukhpuri Sneha Vatika, in different months. The important

physicochemical properties of river water were analyzed. such as temperature, pH, DO, BOD, Total Hardness, Nitrates in Laboratory by using such methods. (Mahajan et al.,2002)

Kunda river cover long distance from origin so selective location-1, location-2, location-3, location-4, location-5 area was chosen for collection of sample generally collection of water was done in all season during morning time in 10 to 11 a.m. polythene bottles were used for sample collection with chemicals (0.1N chromic acid) and tight lid of bottles, brought to laboratory for analysis as per BIS standards. parameter such as hardness pH, TDS and ammonia. were analyzed in the lab of institute but other parameter were analyzed by standard laboratory using advance instrument and standard method.

Results and Discussion

The important parameters were analyzed for physical and chemical characteristics of Kunda river water. Some important parameters like TDS, DO, Temperature, Total Hardness, BOD, COD, Nitrates in river water by standard laboratory techniques. The current value of important parameters of river Kunda was shown in figure.

Table 1: Chemical Analysis of Kunda River Water

S.No.	Test	Unit of Measurement	Limit	Results	Test Method Ref. AOAC/ISO
Physical Parameters					
1	Color	Hazen units	5/15* Max	**15**	IS:3025 (Pt.-4):2021
2	Odor		Agreeable	**Agreeable**	IS:3025 (Pt.-5):2018
3	pH		6.5-8.5	**7.23**	IS:3025 (Pt.-11):1983, RA 2017
4	Turbidity	NTU	1 Max.	**2.18**	IS:3025 (Pt.-10):1984,RA 2017
5	Total Dissolved solids	mg/L	500/2000* Max	**760**	IS:3025 (Pt.-16):1984, RA 2017
General Parameters Concerning Substance Undesirable in Excessive Amounts					
1	Aluminum (Al)	mg/L	0.03 Max.	**0.020**	APHA: 3113 B (23rd Edition)
2	Ammonia (as total ammonia- N)	mg/L	0.5 Max.	**0.50**	IS: 3025 (Pt.-34):1988, RA 2019
3	Anionic detergents (as MBAS)	mg/L	0.2 Max.	**BDL (DL-0.01)**	Annex K of IS: 13428:2005, RA 2018
4	Calcium as Ca	mg/L	75 Max.	**100**	IS:3025 (Pt.-40):1991, RA 2019
5	Chloride	mg/L	250 Max.	**169**	IS:3025 (Pt.-32):1988, RA 2019
6	Fluoride	mg/L	1.0/1.5* Max	**4.0**	IS:3025 (Pt.-60):2008, RA 2019
7	Sulphate	mg/L	200 Max.	**50**	IS:3025 (Pt.-46):1994, RA 2019
8	Nitrate (as NO3)	mg/L	45 Max.	**32**	IS: 3025 (Pt.- 34):1988, RA 2019
9	Total alkalinity as calcium carbonate	mg/L	200/600* Max.	**304**	IS:3025 (Pt.-23): 1986, RA 2019
10	Total hardness as CaCO3	mg/L	200/600*Max.	**454**	IS:3025 (Pt.-21):2009, RA 2019
Parameters Concerning Toxic Substances					
1	Mercury (as Hg)	mg/L	0.001 Max.	**BDL (DL-0.0002)**	IS:3025 (Pt.-48):1994, RA 2019
2	Lead (as Pb)	mg/L	0.01 Max	**BDL (DL-0.001)**	APHA: 3113 B (23rd Edition)
3	Total arsenic (as As)	mg/L	0.01 Max	**BDL (DL-0.001)**	IS: 3025 (Pt.-37): 1988, RA 2019

Table-2: Mean, Variance and Standard Deviation Calculations

Parameters	pH	Hardness (mg/L)	BOD (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Temperature
Location-1	7.2	423	2.1	0.3	28	22.5
Location-2	8.3	465	4.7	o.74	27	25
Location-3	8	455	4.2	0.65	27	24.2
Location-4	8.1	449	3.2	0.58	25	23.5
Location-5	7.2	454	3	0.5	23	23
Mean	7.76	449.2	3.44	0.5075	26	23.64
Variance	0.273	248.2	1.053	0.022891667	4	0.973
Standard Deviation	0.522	15.754	1.026	0.151	2	0.986

Total Solid (TDS+TSS):

In all the sites of Kunda river, value of TDS was observed higher then permissible level. Higher TDS value shows low visibility in aqueous system. High TDS value due to presence of sludge, sewage and microorganism in river water as shown in table 1.

Temperature

It is an important parameter that affect all chemical, biological and physical process and finally change the characterization of river water. In the present study temperature of sample water varied from 12 to 28^{0}C in December month and highest value was recorded in May month. The mean value is 23.64^{0}C of river water temperature recorded as shown in figure 1.

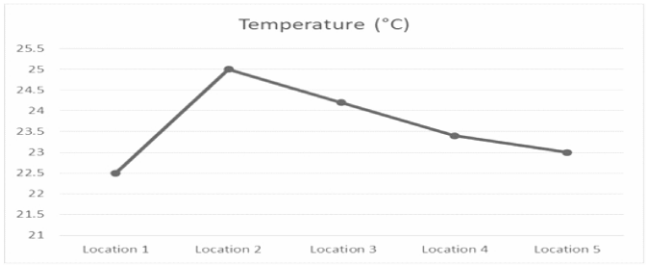


Fig.01

pH Value

It is the concentration of hydrogen ion present in water sample. pH value is indicator of quality of water. The permissible range of pH is 6.5 to 8.5 as per WHO for consumption purpose. The range of sample water was 7.2 to 8.3 which come under the permissible range as shown in figure 2. (Sharma et al., 2012)

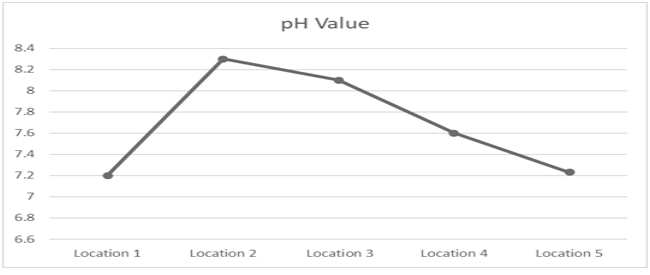


Fig.02

Dissolve Oxygen and Biological Oxygen Demand

BOD and COD - Biological oxygen demand and chemical oxygen demand are very useful parameter for oxidized and non-oxidized organic and inorganic substances in river water. For the standard drinking water its value must follow standard range as described by CPCB. Dissolve oxygen is an indicator of biological exchange in water source by living things. It plays an important and vital role to support aquatic organism for biological activities. It is directly related to health of water bodies. The biological oxygen demand (BOD) is directly related to presence of biodegradable pollutants in water bodies. According to WHO the permissible values of BOD for water bodies should be less than 3 mg/liter. The figure 3 shows value of BOD for selected sites which were 2.1 to 4.7 mg/liter indicating that river water has high amount of pollutants due to presence of domestic, animal and agriculture waste. (Ahmed and Krishnamurthy 1990).

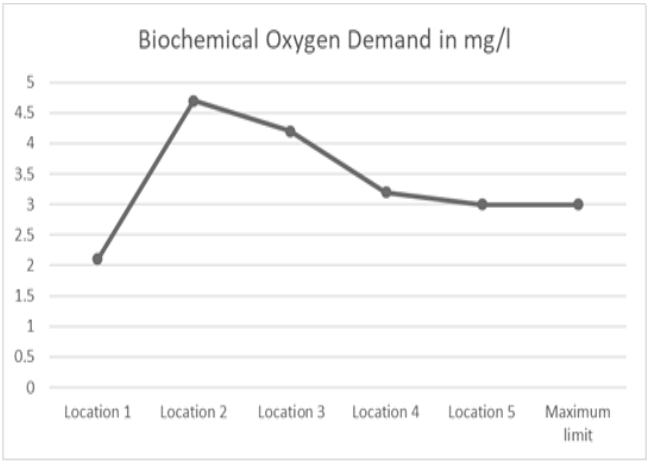


Fig.03

Total Hardness

There are two types of hardness temporary and permanent. The temporary hardness is due to presence of $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$ in water but permanent hardness is due to $CaSO_4$, $MgSO_4$ and $CaCl_2$ etc. Considerable range for hardness is 500

milligrams per liter as per WHO. The data of hardness reveals that variant in hardness observed. The mean value of hardness was 449.2 mg/L as shown in figure 04 (Yadav J. et al., 2012).

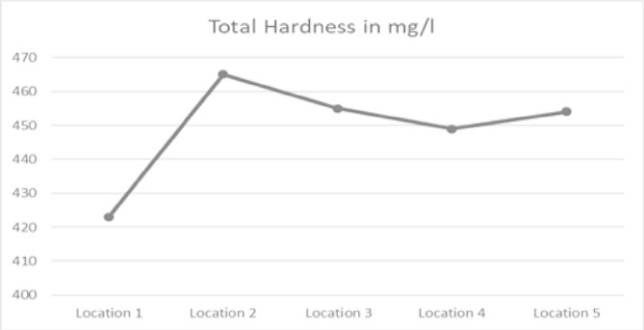


Fig.04

Nitrate

The organic nitrogenous matter that contain in river water are oxidized by microorganism and converted into Ammonia and nitrates. In Kunda river water mostly nitrate ions are present due to use of fertilizers in agriculture field. The concentration of nitrate in river water was observed in the range of 23 mg/L to 28 mg/L the mean concentration of nitrate was observed in L1 & highest value observed in L2. The mean value of concentration of nitrate was 28 mg/l as shown in figure 05.

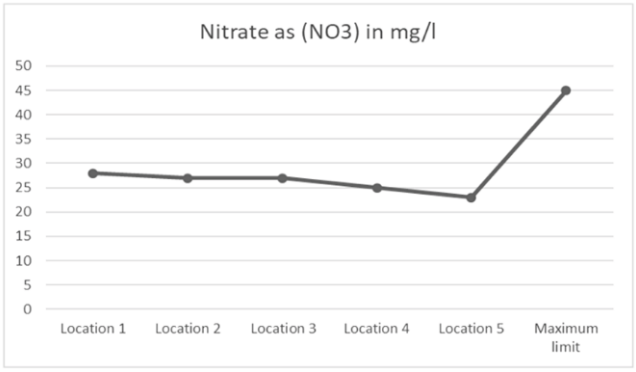


Fig.05

Ammonia

The figure 06 shows the value of ammoniacal nitrogen which is higher then the permissible level (0.5 mg/l) as per CPCB. Depending on pH, The observed value of samples are not favorable for good aquatic life and human health also.(APHA, (2005).

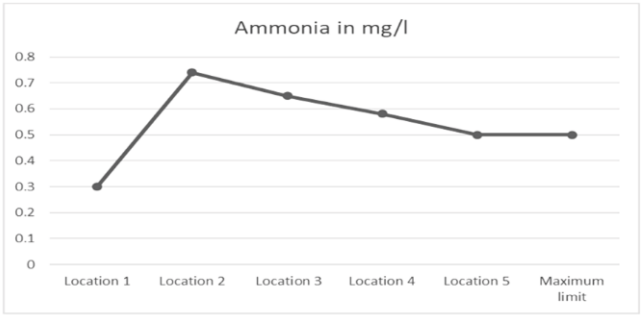


Fig.06

Conclusion

The present work on the basis of observation of chemical and physical parameters of river Kunda showed that location- 2 is more polluted among then other location and range of value was higher than permissible range as per WHO. Heavy metals such as Arsenic, Lead and Mercury were present in permissible range in water as described by CPCB.

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