Water Quality Assessment of Kolar River with Physico-Chemical Analysis (Sehore, MP)

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Abstract **- The study was conducted to assess the water quality of Kolar River (A tributary of Narmada River). The water samples were collected in plastic container of 500 ml capacity from Eight (8) different geographic locations along the river, during both dry and wet season. And samples were collected from water at different selective sampling points. A number of physiochemical water quality parameters including Temperature, pH, EC, TDS, TURBIDITY, DO, Chloride and Nitrate were analysed in field as well as in laboratory. Temperature, pH, EC, TDS, TURBIDITY and DO were elected as field parameters while as chloride and Nitrate as laboratory parameters. The mean value of such respective parameters in both season were compared with the water quality standards as set by the NWQS.**

Index Terms **- Water quality, Kolar River, Physiochemical, variations etc.**

INTRODUCTION

Water is also crucial for the quality of life. The oceans, the rivers, lakes and creeks together with the land constitute the canvas on which life grows and interacts. The ecological balance maintained by the quantity and quality of water determines the way of life of a people. Water has become an essential commodity for the development of industrials and agriculture (Kudesia, 1990). Water is absolutely essential not only for survival of human beings, but also for animals, plants and all other living things (Razo et al., 2004). On the other hand, polluted water is the greatest source of disease and besides debasing the land also becomes unfit to sustain life (Francis, 1994). Today the problem is not only of water availability but of environmental quality and ecological balance. With increasing industrialization, urbanization and technological advance in all fields, sources of water are getting more and more seriously polluted. The survival of life on earth will be threatened if the present rate of pollution continues unabatedly. Natural waters are afflicted with a wide variety of inorganic, organic, and biological pollutants. The fluctuation in river water temperature usually depends on the season, geographic location, sampling time and temperature of effluents entering the stream (Ahipathy, 2006). For public health, chlorides up to 250 mg l-1 are not harmful but values greater than this are indication of organic pollution (Nahar, 2000). Oxygen is the single most important gas for most aquatic organisms; free oxygen (O2) or DO is needed for respiration. DO levels below 1 ppm will not support fish; levels of 5 to 6 ppm are usually required for most of the fish population. The average value of DO levels (6.5mg/l) indicates the average quality of river water (APHA, 1995). The utility of river water for various purposes is governed by physico-chemical and biological quality of the water. The assessment of the changes in river communities as a result of the impact of pollution is particularly interesting issue within the framework of aquatic ecology, since running waters are becoming increasingly affected by anthropogenic discharge (Whitton et al., 1991).

To evaluate the quality of river water for the purpose of health, domestic and irrigation, fisheries, we need to identify the physiochemical characteristics that are important for respective field, and their acceptable levels of concentrations.

MATERIALS AND METHODS

Study Area

The stretch of the Kolar River extends from 0-101km before entering into the Narmada River. Kolar river is one of the major source of drinking water for Bhopal city. The study was conducted between 8 sampling sites except bifurcation of sampling site 5 which has been divided into 5a and 5b. following are the sampling sites of study area- Near Reservoir (S1),

Lavakheri (S2), Water Filtration Plant (S3), Sath Bhavdi (S4), Location Near Old Bridge (S5a), Location Near Old Bridge S5(b), Dana Baba (S6), Amdoh (S7) and Near Road Stop Dam (S8) of the kolar River.

METHODOLOGY

The whole methodology for study of physico-chemical analysis followed from American Public Health Association (APHA) 1998, Twelfth edition, Workbook on Limnology by Adoni, 1985. Besides this MS-EXCEL, MS-WORD and PAST software has been used for the betterment of the results and interpretation. In the graphical representation C, D, E, F, G, H, I, J and K are different sampling sites viz; C=S1, D=S2, E=S3,F= S4, G=S5(a) H=S5(b) I=S6 J= S7 and K=S8.

RESULTS AND DISCUSSION

Temperature :-Temperature of water may not be as important in pure water because of the wide range of temperature tolerance in aquatic life, but in polluted water, temperature can have profound effects on dissolved oxygen (DO) and biological oxygen demand (BOD). The fluctuation in river water temperature usually depends on the season, geographic location, sampling time and temperature of effluents entering the stream (Ahipathy, 1995). The temperature of water samples varies from 41 to 46.0 0C and 31.50 to 32.5 0C (in dry season-Air and water temperature respectively) and 27.5 to 28.9 0C and 21.5 to 24.9 0C (in wet season- Air and water temperature respectively) as shown in (Table 01 and 02). (Solanki and Saraswat 2021) recorded the temperature varied from 17oC to 34oC.

pH :-The higher values of pH represent that there is high chloride, bicarbonate, carbonate etc. that means the water is alkaline. In Kolar River water there is a significant variation of pH in various sampling station in both seasons. pH of the water samples ranged from 7.7 to 8.2 (in dry season) and 7.8 to8.4 in wet season (Table 01 and 02). In pH average value of samples were found 8.01 and 8.16 the permissible limit of pH for irrigation: 6.0 −8.4 (Ayers and Westcot, 1985), 6.0–8.5 (ADB, 1994).

Conductivity :-Its value depends on the concentration and degree of dissociation of the ions as well as the temperature and migration velocity of the ion in the electric filed. The electrical conductivity measures the concentration of ions in water. The concentration of ions depends on the environment, movement and sources water. The soluble ions in the surface water originate primarily from solution of rock materials. Specific conductance of most natural water generally ranges from about 50 to 1500 µS/cm.The Electric Conductivity in the study area ranged between 400 to 480 µS/cm in dry season and 350 to 470 µS/cm in wet season (Table 01 and 02) most of which is lying within standard level of EC of most natural waters.

Total Dissolved Solid: TDS is directly associated with the clarity of water and also the quality of water. And we can say the sum of the anions and cations concentration is equal to TDS. TDS can be calculated by TDS Meter. In the present study TDS varies from 280 to 520 ppm in dry season and 230 to 300 ppm in wet season (Table 01 and 02). As per IS: 10500-2012 acceptable limit is 500 mg/l and permissible limit is 2000 mg/l (Devendra D. 2014, Sajitha V. 2016).

DO: Oxygen is the single most important gas for most aquatic organisms; free oxygen or DO is needed for respiration. The DO levels below 1 ppm will not support fish; levels of 5 to 6 ppm are usually required for most of the fish population. The average value of DO levels (6.5mg/l) indicates the average quality of river water (APHA, 2005). DO values in our study ranges from 6-8.5 in dry season and 7.9-9 in wet season (Table 01 and 02). where as the standard value is about 6.5 ppm. So comparison between average value and standard value of DO is less deviated (Table 01 and 02) so that it represents the good quality of river water for fish life and other aquatic life.

Nitrate :- in the present study the lowest value of nitrate was recorded 0.302mg/l and 0.340mg/l while as the highest value of nitrate was recorded 0.503mg/l and 0.940mg/l respectively during the samplings of both seasons (Table 01 and 02). Colin et al., (2004) recorded the nitrate concentration between 0.8 to 8.7mg/l on stream water quality. The Concentration Of Nitrate In Narmada Water Was Found To Be In The Range Of 0.19 Mg/L To 0.99 Mg/L (Solanki And Saraswat 2021).

Chloride:- In the present study the value for chloride were ranged from 17.99 to 124.99mg/l (Table 01 and 02). Sources of chloride in groundwater include paddy land use rainwater, fertilizers; sewage water industrial pollutants season the runoff water and saline residues from soil and minerals such as biotite (Jeyaruba and Thushyanthy, 2009). Umamaheshwari and Saravanan (2009) recorded the value of chloride ranged from 17 to 111mg/l in Cauvery River Basin.

Turbidity: Suspended Particles in water interfering with route of light is known as turbidity. Turbidityis due to the presence of different types of suspended particles. It is measured by Turbiditymetry. As per IS: 10500-2012 permissible limit is 5 NTU and acceptable limit is 1 NTU (Devendra Dohare et al. 2014)

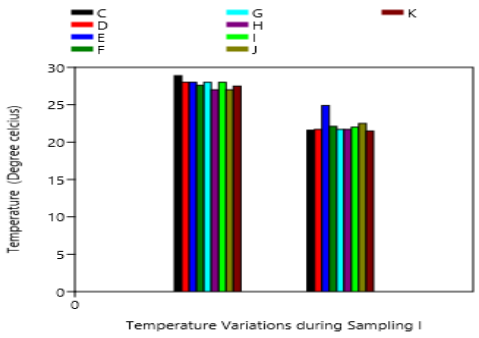
Table 1 Water quality parameters of sampling-I

Station	Near Reservoir (S1)-	Lavakheri (S2)	Water Filtration Plant (S3)-	Sath Bhavdi (S4)-	Location Near Old Bridge (S5a)	Location Near Old Bridge S5(b)-	Dana Baba (S6)	Amdoh (S7)-	Near Road Stop Dam (S8)-
Parameters	S1	S2	S3	S4	S5(a)	S5(b)	S6	S7	S8
Air temperature (^{0}C)	28.9	28	28	27.6	28	27	28	27	27.5
Water temperature(^{0}C)	21.6	21.7	24.9	22.1	21.7	21.7	22	22.5	21.5
pH	8.1	7.8	8.2	8.3	8.4	8.2	8.2	8.3	8.1
Conductivity(µS/cm)	390	390	420	470	380	350	350	380	370
TDS (ppm)	300	250	270	300	240	230	240	260	250
Turbidity	6.9	17.9	10.6	9.4	23	14.2	10.7	14.3	10.6
DO (mg/l)	8.6	7.9	8.4	8.9	9	8.3	8.1	8.4	7.9
Chloride(mg/l)	23.99	17.99	18.99	19.99	124.99	124.99	28.99	19.99	122.99
Nitrate	0.452	0.685	0.808	0.402	0.93	0.922	0.302	0.404	0.94

Table 2 Water quality parameters of sampling-II

Station	Near Reservoir (S1)-	Lavakheri (S2)	Water Filtration Plant (S3)-	Sath Bhavdi (S4)-	Location Near Old Bridge (S5a)	Location Near Old Bridge S5(b)-	Dana Baba (S6)	Amdoh (S7)-	Near Road Stop Dam (S8)-
Parameter	S1	S2	S3	S4	S5(a)	S5(b)	S6	S7	S8
Air temperature (^{0}C)	42	42	46	44	43	43	42	41	42
Water temperature(^{0}C)	32.4	32.3	32.4	32	32	32	32	32.5	31.5
pH	7.9	7.7	8	8.1	8.2	8.2	7.8	8	8.1
Conductivity(µS/cm)	430	420	480	480	400	420	410	470	460
TDS(ppm)	280	370	330	520	360	440	430	280	330
Turbidity	11.8	19	7.9	17.3	26	127	21	23	11
DO(mg/l)	7.5	6	8	7.3	9	8.5	7.2	8.1	8.2
Chloride(mg/l)	32.6	36.8	42.5	100.7	38.2	73.75	87.5	75.5	78.2
Nitrate	0.398	0.34	0.501	0.463	0.386	0.503	0.350	0.500	0.450

Graphical representation of the physico chemical analysis of the selected parameters.



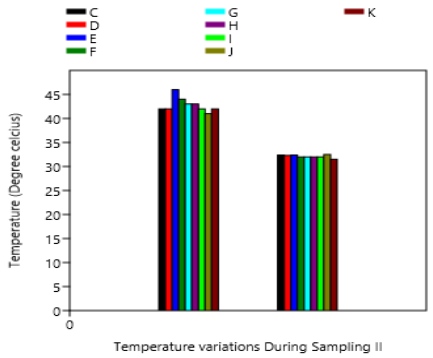
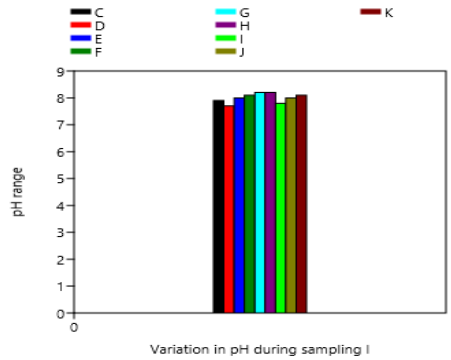


Figure shows variations in temperature.



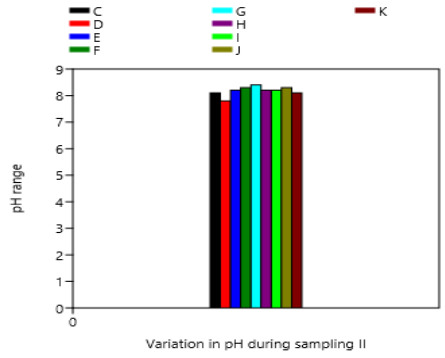
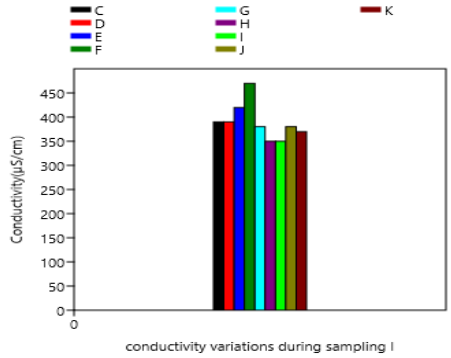


Figure shows variations in pH.



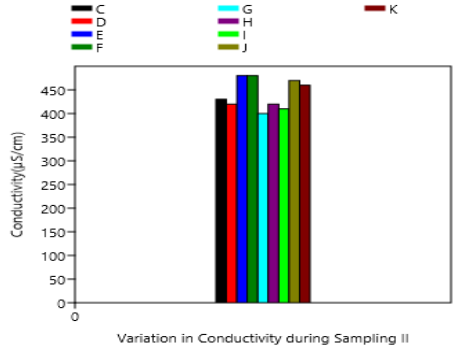
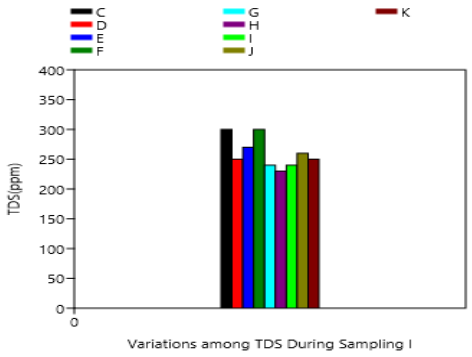


Figure shows variations in Conductivity



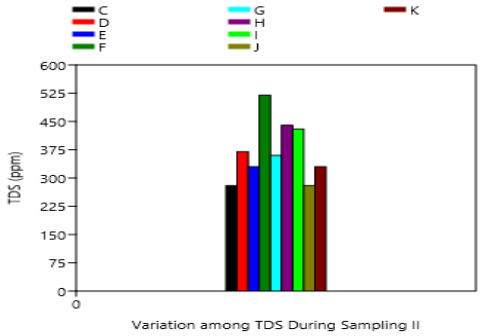
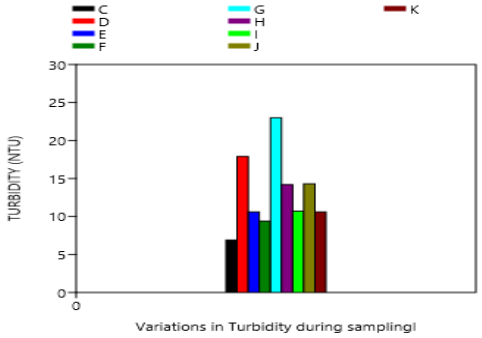


Figure shows Variations in TDS.



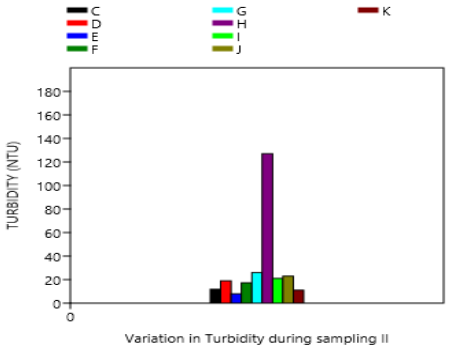


Figure shows variations in Turbidity

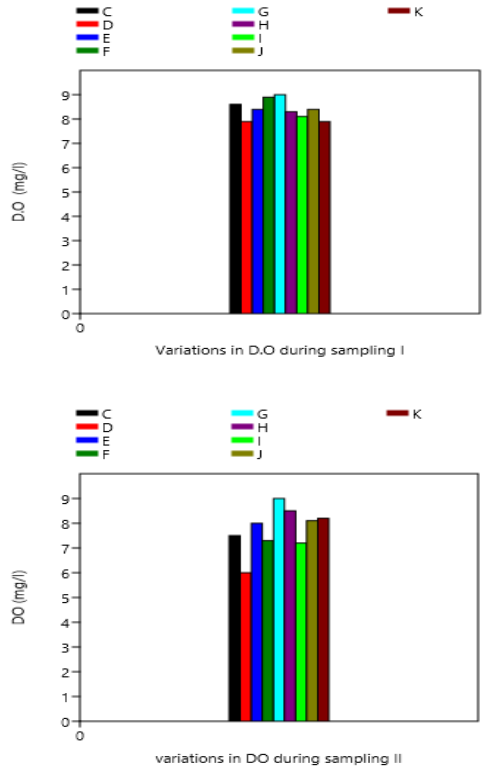


Figure shows variations in DO(mg/l)

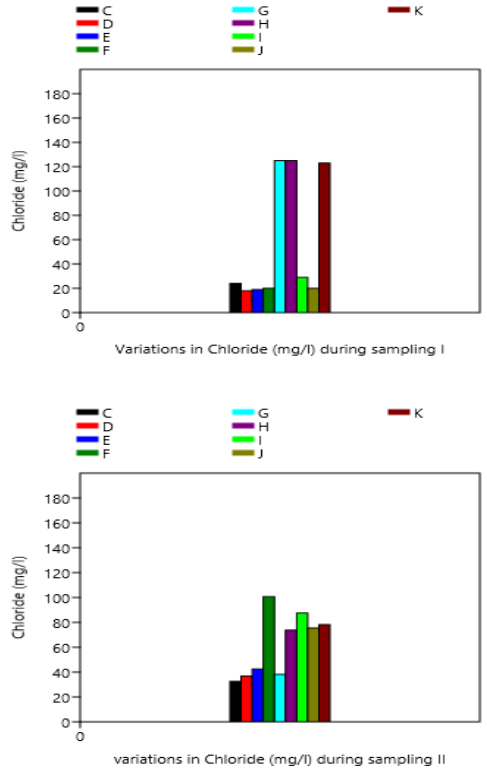


Figure shows Variations in Chloride (mg/l)

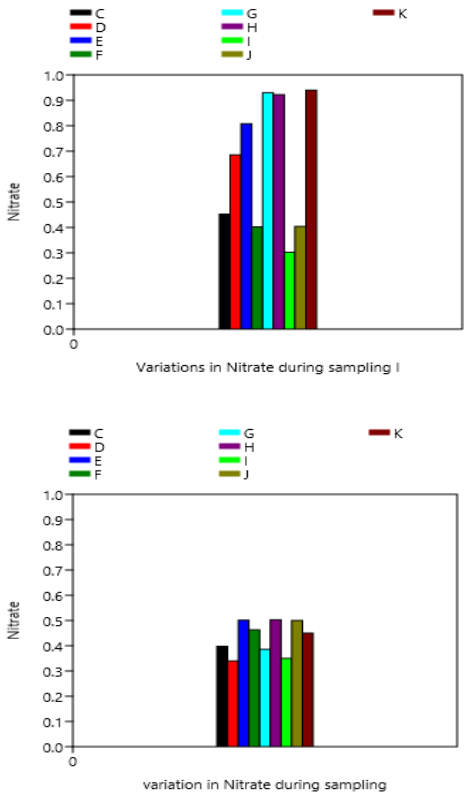


Figure shows variations in Nitrate.

CONCLUSION

The research was conducted to assess the water quality of Kolar River. Kolar river is the main source of drinking water for the Bhopal city. Water quality in the upstream sections of the Kolar river has been found in better conditions than the down stream sections, which is being deteriorated by the communites residing there. In order to protect the environment in general and preserve a good water quality in particularly, especially of the kolar river from Sehore, shared by so many communities. The primary responsibility for water quality and wetlands management lies with state and territory governments, which manage water supply and quality with the support of jurisdiction-specific guidelines, regulations, policies, processes and standards. Hence the Madya Pradesh government should take strict measure to maintain the suitability of water in Kolar river.

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