



Analytical Study of Kajali River, Ratnagiri, Maharashtra

Sangare M. M., Surve R. R.*

Department of Chemistry, Arts, Commerce and Science College, Lanja, Ratnagiri, Maharashtra.

Email: surverishikesh1@gmail.com

ABSTRACT

This analytical study was planned to show the variations in different physico-chemical as well as biological parameters of the water sample of Kajali River at different places of Ratnagiri as well as Lanja Tehsil from Ratnagiri District of Maharashtra. The sampling and Analysis was carried out once in a month for a period of one year i.e. from November 2021 to October 2022. The analysis was done to study the Quality of water. All the results here shows that there is no significant variations in the parameters and they present in tolerable range as per WHO and IS; hence water of Kajali River is suitable for Potable uses.

Keywords: *Kajali river, Physico-chemical, Biological parameters, Tolerable range, Potable.*

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INTRODUCTION

Water is an important part of humans' life. From ancient period with drinking purpose, human used water for washing purpose and also for agricultural purpose and today in modern period water is used for industrial purpose. Earth's largest area is covered with water (almost 70% of area of total earth), but this water is present in form of Sea and oceans and is not suitable for humans for direct use due to alkalinity and hardness. Hence the main source of water for human on earth is rain and the rain water is distributed on earth through Rivers, Underground stream, ponds, Lakes, Wells etc. But this water cannot be used directly today without checking its quality due to water pollution reported from many different water bodies. Water is universal solvent and it absorbs number of organic and inorganic substances, water also become an ecosystem for number of bacteria, viruses and microorganisms which makes the water unsafe for both domestic and industrial use. Such impure water becomes cause for water borne diseases and in case of industrial uses, it can damage the different instruments like boilers, it can contaminate the products produced by the industries. Hence it becomes important to analyze water from its resources. [1] Kajali River is Main River situated in Ratnagiri District. It travels through three tehsils Sangameshwar, Lanja and Ratnagiri of Ratnagiri District, Maharashtra, India. Kajali river is nearly 70 Km in length and is originated from Gad River and Kev River near Sakharpa village of Sangameshwar. Both Gad and Kev rivers originated from Amba Ghat i.e. the Western Ghats area, combines and ends near Bhatye village of Ratnagiri as Kajali River where Arabian Sea starts. River travels from number of villages and becomes main resource of water for people living in the villages of Sangameshwar, Lanja and Ratnagiri tehsil. Kajali River travel most of the distance through Forest and Village areas. The river water mainly uses for domestic, Agricultural and industrial purpose (Near Chanderaai village water is lifted for MIDC, Ratnagiri). There are many small scale industries along the River bed. Cashew nut processing, Mango pulp canning, mineral water distilleries, Bakery, Kokum Pulp canning, Farsaan and Namkeen making small scale industry, Fresh Farm Chicken, Papad and Pickle industries and different types of other food industries uses Kajali river water for various purposes. There are numerous agricultural activities that run across the river like Rice farming, vegetable farming, Nurseries, organic fertilizer and organic pesticides producing, chicken and Goat Farming, which usually uses water of this river. Religious fair also occurs along the river side and Idol immersion occurs hugely during Ganesh and Navratri festivals. This river also gets flooded severely in monsoon period due to heavy to very heavy raining as Ratnagiri district is one of the place where the maximum rainfall occurs after Cherapunji. Hence it is utmost essential to check the water quality of Kajali River. The samples were collected from four villages Chanderaai (A), Navet (B), Anjanari (C), Kangavali (D).

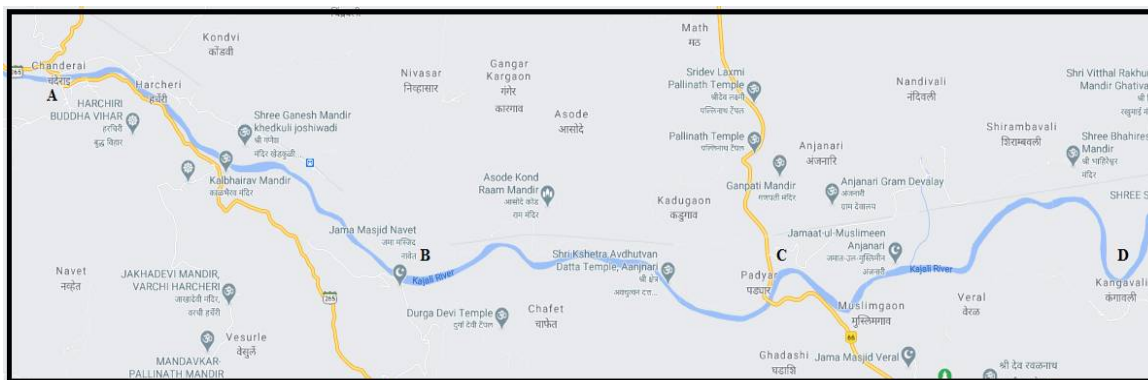


Fig. 1: Google map of Kajali River showing Sample collection sites.

MATERIAL AND METHODS

The water samples were collected from different sample collection sites in suitable cleaned sample containers. The sampling was done once in month from November 2021 to October 2022. The analyses were carried out by using standard methods in laboratory. Both, pH and Temperature were measured by using simple pHmeter and thermometer. Dissolve oxygen was measured by using Wrinkler’s Method, COD was calculated by using Potassium Dichromate method and BOD was calculated by using 5 day Incubation Method. Analysis of Hardness, Ca and Mg was done by using EDTA means Complexometric Titration Method. Total alkalinity was analyzed by using Acid Base titration method. For sodium and Potassium Flame Photometry technique was used. Sulphate, Iron, Chlorides and Nitrates was analyzed by using Turbidometry, Thiocyanate, Argentometric titration and phenol disulphonic acid method respectively. Ammonia was studied by using UV-Visible Spectrophotometry and MPN was studied by using Mac Conkey broth [2].

RESULTS AND DISCUSSION

Table No. 1: Monthly Average Values of Quality Parameters of Water of Kajali River (November 2021 to April 2022)

Months	November				December				January				February				March				April				
	Sample Site	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Temp	°C	27.1	27.4	27.6	27.7	26.6	26.8	27.9	28.1	26.1	26.3	26.6	27.1	26.5	26.8	27.2	27.6	28.3	28.5	28.6	28.9	28.6	28.9	29.1	29.4
pH		7.3	7.1	7.2	7.3	7.1	7.3	7.1	7.2	7.4	7.1	7.1	7.2	7.5	7.3	7.2	7.4	7.2	7.5	7.5	7.1	7.6	7.1	7.2	7.4
DO		5.75	5.64	5.52	5.45	5.67	5.54	5.42	5.30	5.63	5.42	5.40	5.11	5.72	5.51	5.20	5.08	5.62	5.45	5.32	5.31	5.61	5.52	5.21	5.12
BOD		2.5	2.6	3.1	3.9	2.6	2.9	3.4	4.1	2.0	2.4	3.0	4.2	2.1	2.6	3.2	4.0	2.5	2.4	3.1	4.1	2.9	3.5	4.1	4.4
COD		8	14	16	22	8	12	16	21	8	11	13	20	9	11	12	21	8	12	13	21	9	15	17	21
TDS		115	110	109	95.3	108	105	101	94	107	100	99	92	109	105	102	94	108	105	100	95.6	107	104	100	96

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105	92	109	40	2.6	3.4	31.0	40.1	4.0	1.2	0.21	20.3
112	110	110	41	2.8	3.5	35.0	47.3	4.7	1.2	0.19	14.2
121	132	121	52	3.0	3.5	42.3	49.5	5.2	1.5	0.16	10.3
129	155	132	65	3.1	3.9	46.0	52.1	7.2	1.6	0.15	5.4
100	95	102	30	2.1	3.7	24.3	39.2	3.5	1.2	0.25	19.2
110	114	117	41	2.5	3.9	32.4	42.1	4.5	1.3	0.21	13.1
123	125	119	51	3.1	4.0	38.2	46.2	5.2	1.2	0.16	9.3
135	165	123	68	3.0	4.2	40.9	55.2	7.5	1.5	0.14	5.3
97	99	105	41	2.5	3.8	29.6	41.2	3.9	1.2	0.24	21.0
102	102	100	49	2.6	3.9	32.1	40.1	4.8	1.3	0.21	13.0
111	120	120	54	3.0	4.1	39.2	44.3	5.6	1.4	0.15	9.9
132	155	121	66	3.2	4.1	44.3	54.2	7.8	1.6	0.16	5.6
90	90	102	40	2.7	3.7	32.0	40.1	3.9	1.2	0.25	20.1
98	100	90	51	2.6	3.9	35.2	42.0	4.1	1.4	0.20	12.3
103	121	120	52	3.1	4.0	40.2	46.2	5.3	1.6	0.15	9.3
121	160	135	65	3.2	4.2	45.4	51.8	7.2	1.6	0.14	5.4
102	110	112	31	2.3	3.5	29.5	39.4	4.9	1.2	0.23	23.2
112	125	115	40	2.6	3.7	32.2	45.3	5.5	1.3	0.22	15.4
120	136	143	44	2.9	3.9	38.5	52.4	5.9	1.5	0.18	11.6
132	150	157	51	3.2	4.2	43.6	53.2	6.3	1.6	0.16	6.0
101	105	111	41	1.9	3.4	28.1	41.2	4.9	1.0	0.24	22.3
115	121	120	43	2.4	3.5	30.8	47.6	5.4	1.2	0.21	18.3
127	132	137	56	2.9	3.9	37.5	50.3	5.8	1.3	0.19	12.1
130	145	141	68	3.1	4.1	42.3	53.6	6.2	1.5	0.16	5.9
											/100 ml

Table No. 2: Monthly Average Values of Quality Parameters of Water of Kajali River (May to October 2022)

WHO	May				June				July				August				September				October			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
-	30.1	30.4	30.6	30.7	28.6	28.8	28.9	30.1	27.1	27.3	27.6	28.1	26.5	26.8	27.2	27.6	26.3	26.5	27.6	27.9	26.6	26.9	27.1	27.4
-	7.2	7.2	7.1	7.4	7.2	7.5	7.1	7.1	7.3	7.2	7.1	7.2	7.4	7.1	7.2	7.4	7.4	7.6	7.5	7.2	7.5	7.2	7.3	7.1
>4	5.85	5.64	5.32	5.05	5.97	5.84	5.82	5.70	5.93	5.82	5.70	5.61	5.82	5.71	5.60	5.58	5.82	5.65	5.62	5.61	5.71	5.62	5.61	5.52
30	2.4	2.6	3.2	4.2	2.1	2.6	3.1	3.5	2.1	2.3	2.6	3.2	2.2	2.4	3.1	3.5	2.5	3.0	3.5	2.7	3.4	3.7	4.0	4.0
250	8	12	16	20	7	11	15	21	7	10	15	19	8	10	13	20	11	12	19	8	13	16	21	21
500	110	106	102	98	160	136	126	115	205	195	186	155	256	240	236	210	149	121	119	157	135	124	110	500
300-	130	125	114	100	120	116	108	90	120	105	97	90	123	109	101	96	125	105	100	126	120	111	104	300-
200	155	141	120	110	119	103	95	77	130	121	116	100	129	120	112	102	134	116	98	145	132	120	103	200
200	129	128	116	112	121	115	108	102	134	123	106	95	121	110	102	96	124	115	96	135	122	111	105	200
200	68	56	43	41	51	44	40	31	65	52	51	40	66	54	49	41	51	41	30	65	52	41	40	200
45	3.2	3.1	2.8	2.9	2.9	2.6	2.5	2.1	2.9	2.1	1.9	1.7	3.0	2.7	2.4	2.0	2.8	2.4	2.0	3.1	2.8	2.5	2.0	45
100	4.0	3.8	3.7	3.5	4.1	3.5	3.4	3.4	4.1	3.9	3.5	3.1	4.0	3.8	3.7	3.2	4.0	3.8	3.5	4.0	3.8	3.5	3.1	100
130	47.3	41.5	36.8	32.1	40.3	36.5	26.1	21.4	41.4	35.6	26.1	21.6	41.3	34.7	29.0	26.6	40.9	28.4	22.3	41.0	35.3	29.6	24.5	130

100	150	18	1.5	-
41.2	4.7	1.2	0.22	20.1
45.2	4.8	1.3	0.19	14.3
48.6	5.7	1.4	0.18	10.8
52.3	6.2	1.5	0.16	5.9
35.2	4.5	1.0	0.23	18.2
41.0	5.1	1.2	0.19	12.1
45.3	5.8	1.3	0.17	9.1
50.2	6.0	1.4	0.14	5.4
35.2	3.8	1.1	0.21	20.1
40.0	5.1	1.2	0.19	12.1
44.4	5.6	1.4	0.16	9.4
50.2	6.0	1.4	0.15	5.3
34.2	3.8	1.1	0.24	20.0
39.0	4.2	1.2	0.19	11.3
44.2	5.3	1.3	0.17	9.2
50.8	5.9	1.4	0.15	5.1
35.6	4.2	1.2	0.24	21.8
39.2	4.3	1.1	0.22	12.9
45.3	5.2	1.3	0.16	9.6
50.2	5.9	1.4	0.15	5.4
40.1	4.1	1.1	0.22	21.3
48.5	5.0	1.2	0.20	16.3
50.3	5.6	1.4	0.18	10.1
55.6	6.9	1.5	0.16	5.6

Table No.1 and 2 are shows the variations in different parameters of water which was collected from different sites of river and during different months of year 2021-22.

Temperature: The collective study of temperature variation was observed from 26.1 °C to 30.7 °C during whole year at different sites of river.

The previously recorded water temperature varies from 22.5 °C to 35.5 °C from Kayadhu River Hingoli during year 2004 [3]. In the same year temperature of another river Vashishti from Chiplun, Ratnagiri was recorded which ranges from 24°C to 29.5 °C and of same river temperature recorded in 2005 was ranges from 23.75 °C to 29.25 °C [2]. Hence the temperature value observed for the studied river is normal.

pH: The water of river shows pH variation in the range 7.1 to 7.6. The previously recorded high pH was 7.66-7.86 and 7.58-7.66 during study of Panzara dam and river in 1994-95 and during research they observed that the high pH favored the growth of algae [3]. Hence the Ph value is significant for the Kajali River.

Total Hardness: The Total Hardness was found in between 90 and 132 ppm which under permissible range as per WHO.

The previously recorded Hardness is 298 ppm from Khorninko Dam, Lanja, of Ratnagiri District in 2017-18[4]. In previous study some seasonal variation also observed. In case of Sular Pond, Tamil Nadu in summer season the Hardness was 60.80 ppm and in winter season it was 30.5 ppm the results was studied during year 2002 [5]. The hardness increases in monsoon period and exceeds the desirable limit as per the WHO. This happens due to the river gets flooded due to heavy rainfall the rainfall recorded was 261.94 mm in the Ratnagiri District in the said period. This is highly objectionable to use.

DO, BOD, COD: The Dissolve Oxygen, Biological and Chemical oxygen demand are ranges from 5.05 to 5.93 ppm, 2 to 4.4 ppm and 7 to 21 ppm respectively.

The previously recorded data regarding DO, BOD and COD was 6.90 to 11.02 ppm, 1.22 to 3.12 ppm and 160 to 190 ppm respectively. The data is collected from Tillari Dam, Dodamarg, Sindhudurg district of Maharashtra, India in 2014 [6]. But in the monsoon period again the values fluctuates. Dissolved oxygen increases, Biological oxygen demand also increased whereas Chemical oxygen demand decreases.

Alkalinity: Alkalinity value remains nearly same throughout the year and well below the desirable limit as indicated by WHO.

Cations and Anions Concentration: Metal ions like Fe(II), K(I), Na(I) concentration are present in desirable limit but Mg(II), Ca(II) concentration increases in the monsoon period. Anion like Chloride, Nitrate and Sulphate concentration remains desirable throughout the year. Ammonia from water sample of river is also observed in permissible range as per WHO

MPN: The Coliform i.e. MPN is ranged from 5.1 to 23.2 per 100 ml. But the range increases in Monsoon period again. If we study some previous recorded data of different rivers regarding MPN then it is found that above values was very less. In case of Godavari River near Nanded this values was found 200 and 900 per 100 ml (1999-2000) [7] and Ganga River in Bihar this values was 1.3×10^6 and 9.4×10^4 (2000-2001)[8].

Above observations and discussion shows that the water of Kajali River is Safe for Agriculture and also after some treatment it is safe for Industrial as well as Domestic Purpose in the period from December to April but there is some change in quality of water in the period from June to November due to heavy Monsoon and Floods. This water again gets purified by self-healing mechanism after monsoon period. Further the

water quality is unaffected by agricultural and industrial activities. Till today there is no any big chemical industry near this river. But in very near future there are proposed projects of Nanaar Refineries and Jiatapur Nuclear power project which will be 60-70 Km away from the river basin and study of this nature of river will be required. Hence due to the path through which this river travels Kajali River maintain its quality.

CONCLUSION

The Analysis of Physical, Chemical and Biological Parameters show that the values of Water of Kajali River are in acceptable range and are safe for all Agricultural, Industrial and Domestic Purpose for pre and post monsoon period.

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