ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology
Vol. 2, Issue 4, April 2013

WATER QUALITY OF MALAPRABHA RIVER WITH REFERENCE TO PHYSICO-CHEMICAL FACTORS NEAR KHANAPUR TOWN OF BELGAUM DISTRICT

Dr.B.N.Sunkad

Associate Professor, Dept. of Zoology., K.L.E.Society's R.L.Sc.Institute, Belgaum, Karnataka, India

Abstract :River Malaprabha is the one of the prominent rivers of Krishna basin. The total catchment area at Khanapur is about 520 sq km. River originates in the Western Ghat at Kanakumbi village. It flows towards east and confluence with river Krishna at Kudalasangam. The monitoring of water quality of Malaprabha river was carried out for one year from June 2011 to May 2012. Two sampling points were selected, one at upstream of Khanapur and another at downstream of Khanapur town. The collected water samples were analysed by following standard methods. Parameters such as pH, temperature, were measured at site. It is very clear that at the first site all the parameters were well below the permissible limits. But at down stream point chloride , BOD are above the permissible limits and DO in monsoon months were recorded less but within the permissible limits.

Keywords: Malaprabha river, Khanapur upstream, Khanapur downstream Western ghat,

I..INTRODUCTION

In most of the developing countries surface waters have been the most available sources of water used for various purposes such as drinking, irrigation, fishing, domestic purpose such as washing cloths, washing domestic animals, vehicles and also for aesthetic activities. Quality of the water is getting vastly deteriorated due to unscientific waste disposal, improper water management and carelessness towards environment. Water quality is even more severe due to the dependence of modern economy on industrialization [1]. Anthropogenic influences as well as natural processes degrade surface waters and impair use for drinking, industrial, agricultural , recreation or other purposes. Drinking water contaminated with sewage leading to several water waterborne diseases such as cholera, paratyphoid, diarrhea etc.

According to the World Commission on water for the 21st century, more than half of the world major rivers are so depleted and polluted that they endanger human health[2] . Providing drinking water is a challenging task, because of various reasons like poverty, illiteracy, lack of awareness[3]. It is essential to monitor water quality of river or small water bodies regularly to protect biodiversity and cosystems. Thus, it is an attempt to study the water quality of river Malaprabha at upstream and downstream near Khanapur of Belgaum district.

II. MATERIALS AND METHODS

River Malaprabha is the one of the prominent river of Krishna basin. The total catchment area at Khanapur is about 520 sq km. River originates in the Western Ghat at Kanakumbi village which is located between 15^0 42' 20" North Latitude and 74^{0}13',9" East Longitude. It flows towards east and pass Khanapur town finally confluence with river Krishna at Kudalasangam. Study area located between 15^0 37' 50" North Latitude and 74^{0}30',12" East Longitude .The monitoring of water quality of Malaprabha river was carried out for one year.

Sampling points were selected, Khanapur up stream (S II) and down stream (S III). Water samples were collected during 7.30 to 9.00 am and this was uniformly maintained throughout the study period. Collected samples were brought to the laboratory for analysis following the procedures of standard methods APHA [4] and methods for water pollution studies by Trivedy and Goel [5]. Parameters such as pH, temperature, were measured at site and remaining parameters such as Dissolved oxygen, BOD, Conductivity, Total solids, Sodium Potassium Potassium, Total

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology
Vol. 2, Issue 4, April 2013

Hardness ,Calcium and Magnesium analyzed in the laboratory. Statistical application such as coefficient correlation was used.

III. RESULT AND DISCUSSION

Results are presented in Table -1and 2 and correlation coefficient is presented in Table 3, 4 And 5.

Temperature is an important physical parameter of the water body which regulates natural process within the environment and governs physiological functions in organisms [6] . At upstream site, temperature varied from 21^{o}C to 30 ^{o}C. Highest temperature was recorded in April and May and lowest temperature was recorded in July and August. Temperature significantly correlated at 1% level with almost all parameters. At downstream , temperature is fluctuated from 22 ^{o}C to 30 ^{o}C . Minimum temperature recorded in June and July. Maximum values recorded in April and May.

pH is a valuable parameter which guided not only the acid alkaline balance of the water and also serves an important index for the degradation [1]. pH values in upstream site ranged between 7.2 and 8.23. Maximum values recorded in May and minimum values recorded in March. pH values are maximum in summer. Similar variation trend has been recorded in Kanhan river of Maharashtra [7] .

BOD is an important parameter to assess the pollution of surface water and ground water. In upstream site, values were varied from 0.46 mg/l (Oct) to 1.86 mg/l (May). It is correlated significantly with temperature, Ca, Chloride, EC, Mg, SO4, TDS, TH at 1% level and negatively correlated with DO, and Nitrate at 1% level. In downstream site BOD values shows higher than upstream site. Values fluctuate from 0.9 mg/l (July) to 4.02 mg/l (March). High values might be due to high rate of organic decomposition. Similar trends were observed in Coovam river [8] and in temple pond of Puri [9]. It is negatively correlated with DO and Nitrate and positively correlated with TDS, EC at 1% level.

Dissolved oxygen is essential for organisms to maintain their biological process [10]. Presence of oxygen in river is the result of photosynthesis by plants and by dissolution of oxygen from the atmosphere into the water. DO values in the upstream were ranged from 5.3 mg/l (March) to 7.9 mg/l (Oct).In down stream values were fluctuated from 5.5mg/l (Dec) to 8.5 mg/l (August). Low values of DO in down stream during March to May months are due to addition of sewage. Similar findings are recorded in Hamber estuary [11].

Total dissolved solids is an important parameter for drinking and irrigation purposes. In upstream, values were ranged between 88 mg/ (July) and 320 mg/l (May). In downstream values were ranged between 98 mg/l (Oct) and 390 mg/l (March) . Values were little higher than the upstream site, it is due to the mix of domestic sewage from the Khanapur town. Similar observations are recorded Rakasakoppa reservoir of Belgaum [12]. Values are below the permissible limits. High values beyond the permissible limits influence the taste, hardness and corrosive property of water.

Electrical conductivity is a measure of water capacity to conduct electric current, It is directly related to the concentration of salts. Most of the salts present in the water are in ionic form, are responsible to conduct electric current. In upstream values were ranged between 100 µMhos/cm to 490 µMhos/cm and in upstream it was 150 to 600 µMhos/cm. High values are due to sewage and other pollutants.

Chloride is a basic parameter of detecting pollution of water by sewage. The contribution of chloride in water may be due to animal waste. Chloride values in upstream site ranged between 18 mg/l and 108 mg/l. Higher values are observed in summer followed by monsoon. In downstream values ranges between 20 mg/l (July) and 118 mg/l (Feb). Chloride is correlated significantly with EC, K, TDS , Temp at 0.01 level and negatively correlated with nitrate at 1% level. Seasonally higher values observed in summer.

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology
Vol. 2, Issue 4, April 2013

Table 1:

Monthly variations in Physico-chemical factors at site S II: Khanapur Up stream of Malaprabha river

	Temp	pH	BOD	DO	TDS	Ec	Cl	Na	K	SO4	TH	Ca	Mg	NO3	Iron	Flouride	Chromium
June 2011	22	7.62	.8	7	170	110	18	8	1	9	28	16	3.15	3	0.2	BDL	BDL
July	21	7.8	1.1	7.8	88	140	28	8.1	1.2	7	46	12.6	3.52	4.4	.46	BDL	BDL
August	21	8	.9	7.5	110	160	24	14.8	3	10	38	11	2.55	4	.6	BDL	BDL
September	22	7.6	.62	8	120	180	26	16	1.2	20	40	12	2.43	6	1.2	BDL	BDL
October	23	7.38	.46	7.9	90	130	30	14.1	1.8	13	26	8.4	1.21	5	.9	BDL	BDL
November	23	7.6	.8	7.5	138	210	42	14.9	2.6	20	48	15	2.63	2	1.2	BDL	BDL
December	25	7.9	.86	7	140	210	40	16	1.9	20	52	14	4.13	3	1.6	BDL	BDL
January 2012	26	8	1	6	176	268	56	16.1	2	26	66	20	11.7	2	3	BDL	BDL
February	28	8.2	1.2	7.1	260	400	85	20	2.1	32	95	28	6.07	4	3.68	BDL	BDL
March	29	7.12	1.6	5.3	265	410	86	16	1.9	32	118	29	11.17	1.87	1.36	BDL	BDL
April	30	7.9	1.8	5.8	256	400	75	22	3	30	100	30	6.07	2	2	BDL	BDL
May 2012	30	8.23	1.86	6	320	490	108	20	3.1	34.4	118	28	11.66	1.86	1.26	BDL	BDL

Sulphate ion is one of the important anions present in natural waters and produce cathartic effect on human beings when present in excessive limits. In the upstream site values of sulphate ranges between 7 and 34.4 mg/l. Maximum values recorded in summer and minimum values found in monsoon. Statistically SO_4 is positively correlated with temperature, BOD, Ca, Chloride, EC, Mg. Sodium, TDS. and total hardness and sulphate are negatively correlated with DO and nitrate at 1% level. In downstream site values fluctuate between 12 and 60 mg/l. Seasonally similar trends were found as in upstream. Values in downstream are comparatively higher than the upstream but values recorded in both the sites are below the permissible limits. In both sites lower values are observed in monsoon, it is due to the dilution of river water. Similar observation was recorded in Aliyan reservoir of Coimbatore district [13].

In fresh waters sodium occurs through weathering of rocks. In upstream site sodium quantities varied between 8 and 22 mg/l with its summer maxima and winter minima. In downstream it varies 10 to 36 mg/l. Seasonally it shows same results as in upstream. High sodium value make unfit.

Potassium occurs in natural water in low quantity and behaves like sodium and plays a vital role in the metabolism of fresh water environments and considered to be important micronutrient. In upstream values are 1.0 to 3.1 mg/l and in downstream values ranged 3.1 and 3.1 mg/l. Seasonally values are maximum during summer in both the sites.

In general, hard water has known effect on human health but is unsuitable for domestic uses. Hard water that contains high levels of dissolved Ca, Mg and other mineral salts. Total hardness values in upstream were recorded from 28 to 118 mg/l and in downstream values were 38 to 130 mg/l. Values in upstream are relatively higher than that of downstream site, where it receives domestic wastes. Similar observation was recorded in Koushalya river in the submountaneous Shivalik region[14]and temple pond in Kerala [15] . Seasonally high values are recorded in summer and low in monsoon. The lower values of this parameter in both the sites during the course of study showed potable nature of water. The maximum permissible limit for drinking water standard is 500 mg/l.

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology
Vol. 2, Issue 4, April 2013

Table 2:
Monthly variations in Physico-chemical factors at site S III :Khanapur down stream of Malaprabha river

	Temp	pH	BOD	DO	TDS	Ec	Cl	Na	K	SO4	TH	Ca	Mg	NO3	Iron	Fluoride	Chromium
June 2011	22	7.88	1	6.9	120	180	36	10	1.1	12	38	9.6	3.4	4.93	.24	BDL	BDL
July	22	7.22	.9	9.4	130	210	20	16.1	2	20	42	10.1	4.07	6.4	.46	BDL	BDL
August	24	8.42	2.62	10.5	120	170	26	14	1.8	18	40	9.8	3.76	4.44	BDL	BDL	BDL
September	23	7.3	2.34	7.3	122	180	24	16	1.9	20	48	9.1	4.67	4.73	.16	BDL	BDL
October	26	7.36	1.8	6.7	98	150	26	10	1.4	16	36	8.6	3.52	2.71	BDL	BDL	BDL
November	28	7.5	1.42	7.8	130	200	32	18	1.2	20	44	10.2	4.49	1.82	.24	BDL	BDL
December	26	7.53	2.5	5.5	130	200	34	14.2	2.8	14	50	11.5	4.67	2.93	.60	BDL	BDL
January 2012	23	7.97	1.78	6.6	180	280	48	26	3.2	18	72	14.5	7.22	1.47	.70	BDL	BDL
February	26	7.79	2.9	7.2	370	580	118	36	4.2	60	130	29.1	13.85	2.4	.6	BDL	BDL
March	27	8.23	4.02	5.2	390	600	90	26	3.2	52	96	22	9.96	3.11	1.0	BDL	BDL
April	30	7.0	2.8	5.9	210	320	100	20.8	3.5	26	50	11.2	5.34	3.56	1.37	BDL	BDL
May 2012	30	6.8	2.86	5.6	240	370	90	32	2.8	28	76	15	9.11	1.9	1	BDL	BDL

All are average values, expressed in mg/l except temp(C^0), pH and Conductivity (µ mhos/cm). BDL=Below Detectable Limit

Calcium is a major component of natural waters comes mainly from the rocks, seepage, drainage waste water etc [14].Calcium values in upstream are ranged between 8.4 and 30 mg/l and in downstream were 8.6 to 29.1. Seasonally calcium level in both the sites maximum in summer and minimum in monsoon. Magnesium cat ions required as an essential nutrient for plants as well as for animals. Mg values ranged between 1.21 and 11.66 in upstream site and in downstream site 3.4 to 13.85 mg/l were recorded. These values are well below the permissible limit for drinking purpose.

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology
Vol. 2, Issue 4, April 2013

Table.3:
Simple correlation coefficient test between various Physico-chemical parameters at Khanapur Upstream of Malaprabha river

Parameters	Temp	pH	BOD	Do	TDS	Ec	Cl	Na	K	SO4	Th	Ca	Mg	NO3	Fe
Tem	1.000	.230	.836**	-.841**	.924**	.953**	.946**	.790**	.506*	.933**	.935**	.931**	.457	-.627*	.591*
pH		1.000	.298	-.047	.292	.317	.304	.393	.451	.232	.219	.242	.431	-.117	.444
BOD			1.000	-.806**	.861 **	.878**	.851**	.555*	.541*	709**	.917**	.890**	.546*	-.643*	.260
Do				1.000	-.809**-	.769**	-.754**	-.484	-.390	-.732**	-.819**	-.840**	-.321	.819**	-.363
TDS					1.000	.944**	.933**	.665**	.460	.877**	.926**	.957 **	.577*	-.626*	.469
Ec						1.000	.987**	.797**	.572*	.945**	.980**	.936**	.560*	-.569*	.565*
Cl							1.000	.745**	.543*	.928**	.968**	.911**	.601*	-.580*	.561*
Na								1.00 0	.706**	.851**	.698**	.659**	.337	-.306	.669**
K									1.000	.480	.494	.422	.447	-.511*	.233
SO4										1.000	.903**	.871**	.433	-.526*	.698**
Th											1.000	. 946**	.500*	-.597*	.499*
Ca												1.000	.375	-.639*	.557*
Mg													1.000	-.320	-.054
NO3														1.000	-.216
Fe															1.000

Main source of nitrate is the decomposition and biodegradation of organic matter. Nitrate in river water promotes high primary productivity and excess of nitrate in surface water is taken as a warning for algal bloom. In this study nitrate levels were quite lower varying from 1.86 to 4.4 mg/l in upstream and 1.47 to 6.4 mg/l in downstream. Values were increased in the downstream the pollution input gives a sufficient indication of the deteriorating quality of water due to entry of waste water in river. Similar findings have been reported in Narmada river at Hoshingabad city [16]. The concentration of nitrate in both sites are higher in monsoon.

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology
Vol. 2, Issue 4, April 2013

Table.4:
Simple correlation coefficient test between various Physico-chemical parameters at Khanapur Down stream of alaprabha river

	Temp	pH	BOD	Do	TDS	Ec	Cl	Na	K	SO4	Th	Ca	Mg	NO3	Fe
Temp	1.000	-.4388	.5508	-.5212	.3975	.3918	.6261*	.4352	.3727	.3318	.2561	.2319	.3400	-.5871*	.6868*
pH		1.000	.1773	.2914	.1913	.1754	-.1035	-.0683	-.0103	.1922	.1928	.2696	.1024	.0136	-.2158
BOD			1.000	- .4465	.7396**	.7192**	.6769*	.5501	.6578*	.6792*	.6099*	.5940*	.6220*	-.3409	.6459*
Do				1.000	-.4278	-.4287	-.5144	-.3279	-.4325	-.2498	-.3457	-.2986	-.3681	.5294	-.6196
TDS					1.000	.9992**	.878**	.8309**	.7785**	.9549**	.9236**	.932**	.9241**	-.3404	.5404
Ec						1.000	.8766**	.8375**	.7833**	. 9561**	.9292**	.9379**	.9296**	-.3418	.5355
Cl							1.000	.8322**	.8261**	.8099**	.8098**	.7976**	.8450**	-.4232	.7356*
Na								1.000	.8060**	.7825**	.9009**	.8407**	.9371**	-.5294	.4954
K									1.000	.7089**	.8063**	.7747**	.8044**	-.3711	.7037*
SO4										1.000	.9184**	.9417**	.9112**	-.2547	.3644
Th											1.000	.9862**	.9919**	-.4417	.3284
Ca												1.000	.9681**	-.3835	.3083
Mg													1.000	-.4731	.3839
NO3														1.000	-.3106
Fe															1.000

IV . CONCLUSION

The study revealed the values of different Physico-chemical conditions from 2 sites (upstream and down stream) of Malaprabha river at Khanapur town. Water is alkaline throughout the study period. All physic-chemical parameters are below the permissible limits, except BOD and Iron. It is quite evident from the findings that the river is receiving lot of domestic waste from residential colonies in the adjoining areas. Animal waste added continuously to the river by grazing animals. This is the time to bring awareness in the public about water quality. Comprehensive assessment of river is required to assess the water quality. It is also essential to introduction of less water consuming agricultural technologies and methods to mobilize people to take action and how to value water for equitable use for people and the environment. Prevent throwing floral offerings into the river. Local authority may establish a body to monitor the river .

REFERENCES

[1] Joseph Kiran and Shanthi K., " *Impact of Hindustan new print effluent on physic-chemical parameters of Muvattupuzha river, Kottayam (Dist) , Kerala"*,Journal of Basic and Applied Biology 3 (1&2), 93-107, 2009.

[2] Population Report,. "*Population and Environment.*"The global challenge. Population Information Programme, USA., 2000.

[3] Sunkad.B.N., "*Better Management Of Ground Water Source For Drinking Purpose In Belgaum District Of Karnataka, India*". International Journal of Scientific & Technology Research,vol .2 (3), 2013.

[4] APHA., "*Standard Methods for the Examination of Water and Wastewater"*, American Public Health Association. 20th Ed.,Washington, USA . 1998. [5] Trivedy .R.K and.Goel .P.K,. "*Chemical and Biological Methods for water Pollution Studies"*., Environmental Publications, Karad, 1986.

[6] Negi ,R.K, Johal.M.S. and Tarana Negi ;. "*Study of physic-chemical parameters of water of pangdam reservoir, Himachal Pradesh.A Ramsarsite"*.Himalayan Journal of Environment 20(2): 247-251, 2006.

[7] Khapekar and Nandkar; "*Water quality status and investigation of Algal Flora of Kanhan river, Maharashtra, India"*, Poll.Res 26 (1) : 144-147.2007.

[8] Bhuvaneshweari, B. and Devika,R. "*.Studies on the physic-chemical and Biological characteristics of Coovum River"*. Asian Journal of Microbiology Biotechnology &Environmental Science, (3): 449-451,2005

[9] Swain, S.K Mohapatra,S andPatel,R.K. "*A measure of pollution load in temple ponds of Puri, Orrisa on the basis of NSFQQI suggestions".* Pollution Research, 24(3):599-603,2005.
[10] Hariharan,A.V.N.L.S.H. " *Evaluation of drinking water quality at Jalaripeta village of Vishakapatnum district, Andra Pradesh"* Nature Environment & Pollution Technology 4: 407-410,2002.
[11] Woodword,G. M . "*Pollution Control in Hamber estuary".* Water Pollution Control 83(1): 82-90. 1984
[12] Sunkad.B.N and Patil H.S : " *Water quality Assessment of Rakasakoppa Reservoir of Belgaum, Karnataka,"* Indian Journal of Ecology 30(1): 106-109. 2003
[13] Subhashini,S. and Saradamani,N. "*Hydrobiology of Aliyan Reservoir, Coimbatire District, India".* Indian Journal of Environment & Ecoplanning 8 (3): 715-718. 2004.
[14] Agarwal Rhythm and Arora Shakti,,. " *Study of water quality of Koushalya River in the submountaneous Shivalik region*". International Journal of Scientific & Technology Research:1 (8): 52-60. 2012
[15] Chandrasekhar.S.V.A.and P. Muhammed Jafer. " *Limnological studies of a temple pond in Kerala*," Environment & Ecology 16(2): 463-467.
[16] Sharma Shraddha,Vishwakarma Rakesh, Dixit Savita and Jain Praveen , " *Evaluation of water quality of Narmada river with reference to Physico-chemical parameters at Hoshangabad city, MP, India*,".Research Journal of Chemical Sciences : 1 (3) : 40-48. 2011.

ACKNOWLEDGEMENT

Author is grateful to University Grants Commission, New-Delhi for awarding Major Research Project & Financial assistance. He is also thankful to the Principal and Zoology Staff , R.L.Science Institute, Belgaum for their continuous encouragement and co-operation throughout the study period.

BIOGRAPHY

Dr.B.N.Sunkad is serving as a Associate Professor and Head of the Department of Zoology & Biotechnology in K.L.E.Society's R.L.Science Institute, Belgaum., Karnataka, India. He has completed his BSc ,M.Sc and M.Phil from Karnatak University, Dharwad. He been awarded Ph.D from the same University in the year 2002. He guided three students for M.Phil degree. He has published 15 research papers and presented a research paper at Bangkok, Thailand. He worked as Deputy Registrar at Rani Channamma University, Belagavi and as Director, Rani Channamma University PG Centre, Bijapur. He has completed two minor research projects and at present working on Major research project funded by UGC, New-Delhi.