Scholars Journal of Engineering and Technology (SJET) **ISSN 2321-435X (Online)**
Sch. J. Eng. Tech., 2014; 2(1):73-79 **ISSN 2347-9523 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Research Article

Evaluation of Water Quality Of Malaprabha River Near Jalikoppa Bridge, Belgaum

Sunkad BN
K.L.E.Society's R.L .Science Institute, Belgaum, India

***Corresponding author**
Sunkad BN
Email: bnsunkad@yahoo.co.in

Abstract: Water quality has become a major concern due to ever increasing anthropogenic activities that have polluted the water resources. A study on physico-chemical and biological characters of Malaprabha river near Jalikoppa village of Belgaum district. The main purpose of the present study is to know the suitability riverwater for drinking and irrigation purposes. Physico-chemical parameters such as temperature, rainfall, pH, BOD., DO, TDS, EC, Cl, Na, K, Th, Ca, Mg, SO_4, NO_3 and Fe were analyzed for two years using standard methods. The result indicates that the water is suitable for drinking and agriculture purposes.
Keywords: Physical factors, Chemical factors, Jalikoppa, Malaprabha river, Water quality

INTRODUCTION

Most of the Indian towns and cities do not have access to safe drinking water. Rivers are water ways of strategic importance across the world, providing main water resources for domestic, industrial and agricultural purposes [1]. Rivers play a major role in integrating and organizing the landscape and moulding the ecological setting of the basin. The quality and quantity of surface water in a river basin is influenced by natural factors such as rainfall, temperature and weathering of rocks and anthropogenic changes that curtail natural flow of river, or alter its hydrochemistry. Quality of water generally refers to the component of water, which is to be present at optimum level for suitable growth of plants and animals.

River pollution in India has now reached to a point of crisis due to unplanned urbanization and rapid growth of industrialization. The entire array of life in water is affected due to pollution in water. The problem of water quality deterioration is mainly due to human activities such as disposal of dead bodies, discharge of industrial and sewage wastes and agricultural runoff which are major causes of ecological damage and pose serious health hazards. In the present study area lot of sugarcane and cotton is growing. Farmers are using fertilizers and pesticides. Thus, it is an attempt to study water quality of Malaprabha river near Jalikoppa village of Belgaum district.

MATERIALS AND METHODS

Malaprabha river is one of the prominent river of Krishna basin. River originates in the Western Ghat at Kanakumbi village which lies between 150 42' 20" North latitude and 74^0 13' 9" East longitude. The assessment of physic-chemical factors was carried out for two years i.e., from June 2011 to May 2013.

Sampling site was selected at of Malaprabha river near Jalikoppa bridge which is located between" 15^0 42' 19.2" North latitude and 74^0 42' 26.7 East longitude. Samples were collected monthly during 7.30 am to 9.00 am and this was uniformly maintained throughout the study period. Collected water samples were brought to the laboratory for analysis of physico-chemical factors and biological factors following the procedures of standard methods APHA[2]and methods for Pollution studies[3]. Physico-chemical parameters such as temperature, pH were measured at site only. Remaining parameters such as dissolved oxygen, biochemical oxygen demand, EC, total solids, sodium, potassium, total hardness, calcium, magnesium nitrate iron and fluoride were analyzed in the laboratory. Data for rainfall obtained from District Statistical Office. After analysis statistical application such as standard deviation, simple correlation coefficient test was used.

RESULTS AND DISCUSSION

The data on physico-chemical analysis has been presented in Table 1. Simple correlation test was presented in Table 3 and 4.Seasonal variations of Physico-chemical parameters were presented in Table 5.

The physico-chemical factors of natural water body may vary substantially at different seasons of the study period. The factors contributing to such changes include topography of the area, atmospheric precipitation by rain and other meteorological forces in and around water body.

Temperature is an important physical parameter of the water body that governs physiological functions in organisms. According to Mishra and Tripaty[4] fast microbial decomposition followed by release of energy could one of the reasons for increased temperature. In

the present study temperature fluctuate between 20^0C to 30 ^{0}C and 24 ^{0}C to 31 ^{0}C during first and second year of investigation period. First year maximum temperature was recorded in the month of April and May and in second year in the month of March, April and May, seasonally as usual maximum in summer and minimum in monsoon. Temperature is significantly correlated with EC,K,TH,Ca,Mg. It is also negatively correlated with rainfall, and DO.

Rain is a type of precipitation, a product of the condensation of atmospheric water vapour that is released on the earth's surface. Rainfall can be a significant source of variation in surface water quality. Runoff can improve, degrade or not alter the water quality of streams depending on the land use, slope, soil type. Rainfall was ranged between 4.6mm to 123.7 mm. Maximum rainfall observed in the month of June and minimum rainfall was 4.6 mm in May. There was no rainfall from December to May.

pH is a variable parameter which serves as an important index for the degree of pollution. In the present investigation the pH was alkaline throughout the study period and values ranged between 7.1 and 8.4 in 2011-12 and 6.9 to 7.7 during 2012-13 respectively. As per BIS standard the desirable range of pH for drinking water is 6.5 to 8.5. pH above the prescribed limit may cause a nutritional imbalance or may contain a toxic ion in which can adversely affect the growth and development of aquatic life. Similar values recorded [5]in river Majidun, Molatori in Nigeria.

BOD is the amount of organic matter in the water and the amount of oxygen required by the micro-organisms to stabilize the biologically decomposable organic matter in wastes under aerobic condition. In the present work BOD values fluctuate between 0.6 mg/l and 1.00 mg/l during 2011-12 and 0.4 mg/l to 1.4 mg/l during 2012-13. The BOD values were higher in summer could be a result of reduced rate of water flow, degradation of organic matter and accumulation of wastes due to anthropogenic activities, while low BOD values during monsoon could be attributed to the dilution of river water [6]. The higher values of BOD due to favorable environmental conditions for micro biological activities at higher temperature [7].

Dissolved oxygen has been attributed a great significance as an indicator of water quality. DO values in surface water body indicate the ability to support aquatic life. Do concentration in water is mainly dependent upon temperature, dissolved salts velocity of wind, pollution load etc. In the present study, DO values were recorded 6.2 mg/l to 8.64 mg/l and 6.8 mg/l to 7.9 mg/l in first and second year of the investigation period respectively. Seasonally fewer values were recorded in winter in both the years of study period. Similar observations made by Murugesan and Rajkumari[8]. Dissolved oxygen is essential for sustaining the plant and animal life of any aquatic system. If Do level drops below the level necessary to sustain normal life then the aquatic system is classified as polluted .Dissolved oxygen is negatively correlated with BOD, TDS,EC, Cl,Na,K,TH Mg and nitrate in first year and during second year it was negatively correlated with pH at .001 level .

Total dissolved solid is a measure of the solid materials dissolved in the river water. The desirable and maximum excessive level of TDS in drinking water prescribed by BIS is 500 mg/l and 2000 mg/l respectively. TDS values ranged between 146 mg/l and 270 mg/l in first year and in second year values were 130 mg/l to 200 mg/l. Seasonally maximum values recorded in summer in both the investigation period.TDS values were well below the desirable limit. So, water may be utilized for drinking purposes. The lower values are indicative of non-industrial pollution. According to various workers in many natural water bodies of India, TDS is proportional to the degree of pollution [9] and [10].These reports are in agreement with the results of the present work.

Electrical conductance of the water is the ability of water to conduct current and sometimes referred to as specific conductance. Electrical conductivity depends on the ionic strength of the water. In the present study EC values were recorded from212 to 422 µ mhos/cm and 178 µmhos/cm to 310 µ mhos/cm during first and second year of the investigation period. Seasonally maximum values were recorded in summer in both the years. Similar findings were recorded in Mula dam of Rahuri[11]. Statistically EC correlated with temp, TDS, Cl,Na,K,Th, Mg and inversely correlated with rainfall and DO. Similar observations were recorded by [12] and [13].Higher conductivity alters the chelating properties of water bodies and creates an imbalance of free metal availability for flora and fauna.

Chlorides are widely distributed in nature, usually in the form of sodium, potassium and calcium, although many minerals contain small amounts of chloride as an impurity. BIS has recommended a desirable limit of 250 mg/l of chloride for drinking water. In the present study chloride values were ranged 41.4 mg/l to 68.8 mg/l and 30 mg/l to 80 mg/l during 2011-12 and 2012-

13 respectively. Seasonally higher values observed during summer in both the years. Statistically chloride was positively correlated significant with K, Na, Th and negatively correlated with DO. The most important sources of chlorides in fresh water are the discharge of domestic and industrial sewage. Higher concentration of chlorides deteriorates the water quality [14]. But in the present study values were below the desirable limits as prescribed by BIS [3].

Sodium and Potassium are the most important minerals occur naturally. Sodium plays an important role in human body. The maximum permissible limit of sodium is 200 mg/l.In the present investigation, sodium values ranged 12 mg/l to 40 mg/l and 8 mg/l to 18 mg/l during first and second year of the investigation period. Sodium is significantly correlated with TDS, EC, Cl,Th and Mg in both the years of study period. Similar observations recorded in Ganga river of Haridwar [15]. Potassium values were ranged from 2 mg/l to 4.5 mg/l and1.8 mg/l to 5.2 mg/l during first and second year of study period respectively.

Sulphate itself has never been a limiting factor in aquatic ecosystems. Sulphate ion is one of the important anion present in natural water and produce cathartic effect on human beings when present in excess amount. In the present study sulphate values ranged 6mg/l to 18.2 mg/l and 6.8 mg/l to 14.6 mg/l during first and second year of study period. Seasonally sulphate values were maximum in monsoon in both the years but Hulyal and Kaliwal[16] reported that sulphate values were maximum in summer in Alamatti reservoir of Bijapur.

Total hardness of water generally indicates the concentration of calcium and magnesium ions. According to BIS desirable and maximum permissible level of hardness in drinking water is 300 mg/l and 600 mg/l respectively. In the present study total hardness values were recorded from 78.6 mg/l to 141.8 mg/l and 56 mg/l to 122 mg/l during first and second year of study period respectively. Similar observation recorded in Ghataprabha river of Karnataka [17]. Seasonally maximum values were recorded in summer. Similar observations recorded [16] in Alamatti reservoir of Krishna river of Karnataka. Statistically total hardness was correlated with temp, rainfall, TDS, EC,K,Cl,Mg,Ca and negatively correlated with DO and SO_4 in both the years . It was inversely correlated withpH during 2012-13.

Calcium and magnesium play important role in antagonizing the toxic effects of various ions[18]. In the present study calcium values fluctuated from 16.8 mg/l to 30.2 mg/l and 13 mg/l to 26.4 mg/l during first and second year of study period respectively. Seasonally maximum values were recorded in summer in both the years. Magnesium is required as an essential nutrient for plants and animals. Concentration of magnesium recommended for drinking water is 30 mg/l. In the present study values were ranged between 4.13 mg/l and 16.2 mg/l in first year and from 3.28 mg/l to 13.7 mg/l during second year of investigation period.

The concentration of different forms of nitrogen are useful indicators of the level of micro-nutrients in the waters and hence their ability to support plant growth. Runoff from agricultural fields is also contains nitrate. In the present study nitrate values were ranged 3.6 mg/l to 7.2 mg/l and 2.9 mg/l to 7.1 mg/l during first and second year of the study period respectively. Similar observations were recorded in Tunga river[19] and in Priyar river of Kerala [20].Maximum values were found in summer season. There is sharp increase in the values in the summer because of anthropogenic activities.

Nitrates react directly with hemoglobin in human blood and other warm blooded animals to produce methemoglobin which destroys the ability to red blood cells (RBC) to transport oxygen. The values observed in the river were within the permissible limits [21].

Iron is an essential element in the metabolism of animals and plants. The recommended upper limit for iron in public water supplies is 0.3 mg/l. In the present work Iron values were fluctuate 0.05 mg/l to .45 mg/l and 0.1 mg/l to 0.5mg/l during first and second year of study period respectively. The presence of higher concentration of iron may be due to leaching of iron containing rocks and minerals. Excess iron dosage through drinking water may cause general weakness, constipation, muscle weakness, vomiting, high pulse rate, hypertension, low blood pressure, lung irritation etc. Presence of iron in considerable amounts in water imparts colour and develops turbidity when exposed to air, consequently water becomes unacceptable for drinking.

Fluoride and chromium are totally below the detectable limits.

Table1: Monthly variations in Physico-chemical factors of Malaprabha river at near Jalikoppa Bridge during 2011-12

	temp	RF	pH	BOD	DO	TDS	EC	Cl	Na	K	SO_4	TH	Ca	Mg	NO3	Fe	F	Cr
Jun. 2011	24.2	123.7	7.8	.8	7.9	146	212	41.4	12	2	10.4	80.8	20.6	7.11	6.2	.31	BDL	BDL
Jul.	20	85.8	8	.8	6.7	210	322	51.2	20	2.2	18.2	89.6	16.8	11.5	6.4	.1	BDL	BDL
Aug.	21	81.7	7.7	.6	7.6	160	240	56.2	30	2.9	12.8	78.6	20.2	6.82	6.2	.2	BDL	BDL
Sep.	21	82.5	7.4	.9	7.38	160	230	51	14	2.1	12	90.6	28.4	4.76	6.3	.05	BDL	BDL
Oct.	22	119.9	7.2	1.0	8.64	154	226	50.2	12	2.6	9.2	68.6	20.6	4.13	4	.6	BDL	BDL
Nov.	23	00	8.4	.7	7.52	180	270	48	21	4	8	106.3	28.8	8.33	3.6	.6	BDL	BDL
Dec.	26	00	7.2	.72	7.3	226	340	70	18	4	8.4	118.4	26.4	12.73	4.8	.17	BDL	BDL
Jan.'12	27	00	7.4	.64	8.3	176	256	42.2	14.6	2.6	7.8	98.2	24.8	8.8	5.4	.2	BDL	BDL
Feb.	29	00	7.2	.6	7.5	240	380	42.4	20	3.2	12.6	116.8	26.2	12.46	6.6	.44	BDL	BDL
Mar.	30	00	7.16	.84	7.2	250	390	60.8	24	3	8	122.8	26.4	13.8	7.2	.35	BDL	BDL
Apr.	30	16.2	7.1	.9	6.7	230	366	68.8	30	4.5	6	128.4	30.2	12.85	6.4	.45	BDL	BDL
May	30	4.6	7.6	.9	6.2	270	422	59.2	40	5	7	141.8	29.2	16.2	6.6	.4	BDL	BDL

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

Table-2:Monthly variations in Physico-chemical factors of Malaprabha river near Jalikoppa bridge during 2012-13

	Temp	RF	pH	BOD	DO	TDS	EC	Cl	Na	K	SO4	TH	Ca	Mg	NO3	Iron	Fl	Cr
Jun-12	24	59.4	7.6	0.9	7.4	130	206	30	8	2.2	14.6	56	17	3.28	5.3	0.3	BDL	BDL
Jul	25	38.8	7.7	0.8	6.9	143	220	38	9	2.1	11.4	60	16	4.86	3.9	0.2	BDL	BDL
Aug	26	48	7.6	0.9	7.4	156	240	41	16	2.8	12	64	14	8.5	4.6	0.1	BDL	BDL
Sept	24	39.2	7.4	0.4	7.8	143	220	48	12	3	10	66	13	7.9	3.2	0.42	BDL	BDL
Oct	26	48.2	7.2	0.4	7.8	120	178	32	10	2.8	9	78	20	6.8	2.9	0.26	BDL	BDL
Nov	28	45.7	7.7	0.6	7.2	130	190	42	9	1.8	7.6	80	20	7.3	3.6	0.28	BDL	BDL
Dec	28	29.4	7.4	0.58	7.3	186	240	60	13	2	8.4	110	26	10	5.4	0.18	BDL	BDL
Jan-13	27	0	7.1	0.62	7.9	186	235	60	17	2.8	11.2	122	26.4	13.6	5.8	0.4	BDL	BDL
Feb	28	0.4	7.1	1.01	6.9	200	300	72	14	4.1	8.1	118	24.8	13.4	5.2	0.36	BDL	BDL
March	30	3.4	7.1	1	7	198	310	80	18	4.2	6.8	100	22	10.9	7.1	0.31	BDL	BDL
April	30	23.8	7	0.9	7.6	196	290	70	17	4	6.9	112	22.2	13.4	6.6	0.5	BDL	BDL
May	31	117.6	6.9	1.4	6.8	176	276	59	10.2	5.2	7.4	108	24.6	13.7	5.1	0.4	BDL	BDL

Table 3 : Simple correlation coefficient test between physico-chemical factors of Malaprabha river at London Bridge near Jalikoppa village during 2011-12.

	TEMP	RF	PH	BOD	DO	TDS	EC	CL	NA	K	SO4	TH	CA	MG	NO3	FE
TEMP	1.000															
RF	-.723**	1.000														
PH	-.525*	.174	1.000													
BOD	.009	.359	-.243	1.000												
DO	-.343	.370	-.095	-.160	1.000											
TDS	.759**	-.719**	-.314	.042	-.738**	1.000										
EC	.763**	-.703**	-.314	.041	-.742**	.997**	1.000									
CL	.318	-.323	-.383	.297	-.552*	.517*	.512*	1.000								
NA	.456	-.427	.029	.012	-.757*	.653*	.671**	.531*	1.000							
K	.616*	-.684*	-.082	.055	-.571*	.678**	.681**	.613*	.749**	1.000						
SO4	-.653*	.500*	.328	-.231	-.040	-.233	-.222	-.358	-.240	-.624*	1.000					
TH	.838**	-.839**	-.252	.015	-.716**	.908**	.901**	.523*	.656*	.810**	-.506*	1.000				
CA	.629*	-.710**	-.256	.111	-.359	.469	.461	.366	.366	.686**	-.710**	.755	1.000			
MG	.758**	-.709**	-.190	-.066	-.758**	.960**	.956**	.492	.663**	.671**	-.231	.897**	.388	1.000		
NO3	.382	-.051	-.310	.007	-.534*	.449	.464	.123	.398	-.086	.239	.336	.014	.463	1.000	
FE	.326	-.169	.030	.207	.172	.120	.153	-.065	.144	.444	-.508*	.168	.271	.051	-.427	1.000

** Correlation is significant at the 0.01 level (1-tailed). * Correlation is significant at the 0.05 level (1-tailed).

Table 4 : Simple correlation coefficient test between physico-chemical factors of Malaprabha river at London Bridge near Jalikoppa village during 2012-13

	TEMP	RF	pH	BOD	DO	TDS	EC	Cl	Na	K	SO4	TH	Ca	Mg	NO3	Fe
TEMP	1.000															
RF	.054	1.000														
PH	-.687	.055	1.000													
BOD	.581	.365	-.394	1.000												
DO	-.424	-.247	-.014	-.721	1.000											
TDS	.690	-.437	-.671	.471	-.258	1.000										
EC	.693	-.269	-.654	.683	-.455	.909	1.000									
CL	.751	-.457	-.707	.400	-.267	.946	.905	1.000								
NA	.428	-.619	-.501	.122	.198	.771	.675	.743	1.000							
K	.682	.168	-.850	.705	-.328	.603	.783	.659	.401	1.000						
SO4	-.821	.090	.576	-.167	.280	-.497	-.505	-.681	-.312	-.534	1.000					
TH	.757	-.334	-.788	.270	-.079	.839	.637	.822	.571	.529	-.628	1.000				
CA	.705	-.210	-.661	.262	-.169	.671	.444	.635	.316	.358	-.520	.922	1.000			
MG	.770	-.211	-.836	.402	-.081	.853	.742	.839	.677	.720	-.626	.917	.724	1.000		
NO3	.602	-.350	-.507	.548	-.206	.819	.788	.756	.683	.461	-.236	.600	.537	.562	1.000	
FE	.341	-.067	-.669	.154	.210	.355	.373	.466	.208	.563	-.363	.480	.314	.535	.301	1.000

** Correlation is significant at the 0.01 level (1-tailed). * Correlation is significant at the 0.05 level (1-tailed).

Table:2: Seasonal variations in Physico-chemical factors of Malaprabha river at Jalikoppa during 2011-12 & 2012-13.

	2011-12			2012-13		
	Monsoon	**Winter**	**Summer**	**Monsoon**	**Winter**	**Summer**
Temp	21.55±0.91	24.5±1.19	29.75±0.25	24.7±0.47	27.25±0.47	29.75±0.62
Rainfall	93.42±10.13	29.97±29.97	5.2±3.82	46.35±4.84	30.82±11.08	36.3±27.59
pH	7.72±0.12	7.55±0.28	7.26±0.11	7.57±0.06	7.35±0.13	7.02±0.09
BOD	0.77±0.06	0.76±0.08	0.81±0.07	0.75±0.11	0.55±0.05	1.01±0.11
DO	7.39±0.26	7.94±0.32	6.9±0.29	7.37±0.18	7.55±0.17	7.07±0.18
TDS	169±14.06	184±15.12	247.5±8.53	143±5.30	155.5±17.72	192.5±5.56
EC	251±24.36	273±24.24	389.5±11.89	221.5±6.99	210.75±15.67	294±7.25
Cl	49.95±3.09	52.6±6.04	57.8±5.54	39.25±3.72	48.5±6.94	70.25±4.32
Na	19±4.04	16.4±1.96	28.5±4.34	11.25±1.79	12.25±1.79	14.8±1.75
K	2.30±0.20	3.30±0.40	3.92±0.48	2.52±0.22	2.35±0.26	4.37±0.27
SO4	13.35±1.69	8.35±0.32	8.4±1.45	12±0.96	9.05±0.77	7.30±0.29
TH	84.90±3.04	97.87±10.6	127.45±5.33	61.5±2.21	97.5±10.96	109.5±3.77
Ca	21.5±2.45	25.15±1.72	28±1.0	15±0.91	23.1±1.79	23.4±0.75
Mg	7.54±1.42	8.49±1.75	13.82±0.83	6.13±1.24	9.42±1.55	12.85±0.65
NO3	6.27±0.09	4.45±0.40	6.7±0.17	4.25±0.45	4.42±0.69	6.0±0.50
Fe	0.11±0.05	0.39±0.12	0.41±0.04	0.25±0.06	0.28±0.09	0.39±0.08

CONCLUSION

The study of physical and chemical characteristics of river water provides a considerable insight into the quality of water present in rivers. The results from the present study clearly pointed out that river water was unpolluted in the study area except iron. Iron values were normal in monsoon and winter, but little higher values are observed during summer. Iron can be toxic to freshwater aquatic life >1 mg/L and may interfere with fish uptake of oxygen through their gills if found> 0.3 mg/L. Rest of the parameters were within the permissible limit. Thus, river water is suitable for drinking and for agriculture.

ACKNOWLEDGEMENT

Author is grateful to University Grants Commission, New Delhi for awarding Major Research Project and Financial assistance. Author is also thankful to the Principal and staff of Zoology Department, R.L.Science Institute, Belgaum for their continuous encouragements throughout the study period.

REFERENCE:

1. Faith Ngwenya; Water quality trends in the Eerste river, Western Cape, 1990-2005. A mini thesis submitted in partial fulfillment of the requirements for the degree of Magister Scientiae, Integrated Water Resources Management in the Faculty of Natural Science, University of Western Cape, 2006; 41.
2. APHA; Standard Methods for Examination of Water and Waste water. American Public Health Association 20thEdn. 1998;New York.
3. BIS; Bureau of Indian Standards Drinking water specification, I strevision.ISS,10500. 1991.
4. Mishra BP, Tripaty BS; Seasonal variation in physic-chemical characteristics of Ganga water as influenced by sewage discharge. Indian Journal of Ecology, 2003; 30(1):27-32.
5. Bolawa OE, Gbenle GO; Analysis of industrial impact on physiochemical parameters and heavy metal concentrations in waters of rive Majidun, Molatori and Ibshe around Ikoroda in Logos, Nigeria, Journal of Environmental Science and Water resources, 2012; 1(2). 34-38.
6. Upadhaya RK, Rana KS;Pollution studies of river Jamuna at Mathura. Int.J.Nat Environ, 1991;8: 56-61.
7. Tamot Praveen, Rajesh Mishra, Somdatt; Water quality monitoring of Halali reservoir with reference to cage aquaculture as a modern tool for obtaining enhanced fish production, Proceedings of Taal 2007, The 12th World Lake Conference, 2008; 318-324.
8. Murugesan AG, Rajkumari C; Environmental science and biotechnology. M.J.P Publication , Chennai, 2005; 1-460.
9. Tripathy PK, Adhikari SP; Preliminary studies on the water pollution of river Nandira. Ind.J.Environ. Hlth, 1990; 32: 363-368.
10. Sunkad BN;Study of water quality of Malaprabha river near Habbanatti, Belgaum, Karnataka. Sch.J.Eng.Tech., 2013; 1(4): 198-203.
11. DhembareAJ; Statistical approaches for computing diversity and density of zooplankton with water factors in Mula Dam, Rahuri, MS, India, European Journal of Experimental Biology, 2011;1(2):68-76.
12. Raghunathan P, Beauman. WH, Kreusch EG; Efficiency of point of use treatment devices, Journa; Amer. Water Works Assoc, 1983;75 (1):42.
13. Aydin A;The microbiological and physic-chemical quality of ground water in west in west Threce, Turkey, Polish J Environ, Stud., 2007; 16 (3):377-383..
14. Goudar MA, Sayeswar HA, Nafeesa B; Physico-chemical aspects of pollution of Tunga river at Shivamogga, Karnataka, India. The Ecoscan, 2012; 6(1&2): 17-22.
15. Joshi DM, Bhandari NS, Alok Kumar, NamitaAgrawal; Statistical analysis of physico-chemical parameters of water of river Ganga in Haridwar district. Rasayan. J. Chem, 2009; 2 (3): 579-587.
16. Hulyal, Kaliwal; Seasonal variations in physic-chemical characteristics of Almatti reservoir of Bijapur district, Karnataka State**.** International journal of Environmental Protection, 2011; 1(1),58-67.
17. Shivayogimath CB, kalburgi PB, Deshannavar UB, Virupakshaiah DBM; Water quality evaluation of River Ghataprabha, India,. Res Journal of Environ Sci. 2012;1(1), 12-18.
18. Sunkad BN, Chavan VA; Zooplankton abundance in Malaprabha river; Impact of environmental variables. Online Intl.interdiscplinary Res J, 2013; 3(5):133-144.
19. Nataraj S, Purushotama R, Manjunatha R; Nutrient status of Tunga river, Shivamogga, Karnataka. J. Aqua. Biol, 2009; 24(2):113-117.
20. Subin, Husna; An assessment on the impact of waste discharge on water quality of Priyar river lets in certain selected sites in the Northern part of Ernakulum district in Kerala, India. Intl. Res.J of Environ Sci. 2013; 2 (6), 76-84
21. WHO; Guidelines for drinking water quality. Health criteria and other supporting information, WHO publ.vol.1, 3rdEdn, Geneva. 2004.