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CHEMICAL AND MICROBIAL ANALYSIS OF RIVER KRISHNA WATER DURING PUSHKARAM

Microbiology

M Vijayalakshmi* Department of Chemistry, MLR Institute Of Technology, Telangana *Corresponding Author
V Ramesh Sharma Department of Botany, Government junior college, Hyderabad
Padma Madham Department of Microbiology, Aurora Degree and PG College, Hyderabad
Kesavapriya K Department of Biochemistry, Andhra University

ABSTRACT

The chemical and microbial characteristic of river KRISHNA has been studied during KRISHNA Pushkaram 2016. KRISHNA is one of the rivers in India. Pushkaram is the festival of which occurs KRISHNA once in 12 years. At this time of Pushkaram lakhs of people took bath in KRISHNA water. The present analysis on water was carried out for one year i.e., from 12th AUGUST to AUGUST 23RD 2016 means before Pushkaram, during Pushkaram and after Pushkaram. For water quality analysis different sampling stations were selected. The water samples were collected and analyzed as per the standard methods of APHA (1999). In this study Temperature, PH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Calcium, Magnesium, Iron, Fluoride, Chloride, Total Dissolved Solids (TDS), sulphate, E-Coli parameters were analyzed. The obtained results are compared with water quality standards given by World Health Organization, Environmental Protection Agency and Bureau of Indian Standards. During Pushkaram there are some deviations in physico chemical parameters, but there is drastic change in E-Coli. On the basis of various parameters studied during Pushkaram, KRISHNA water is polluted due to anthropogenic activities.

KEYWORDS

Krishna Pushkaram, physico-chemical and microbial parameters, anthropogenic activities.

1.0 INTRODUCTION:

Water is the basic need for human beings. Rivers are the sources of water for drinking, for obtaining food etc. The Krishna River is the fourth longest river in terms of water inflows and KRISHNA river basin area size 258,948 km square, Length 1400 km in India. The Krishna River Originates in the Western Ghats near Mahabaleswara and empties into the Bay of Bengal at Hamasaladeevi,on the east coast. The River is 4th biggest river in terms of water flows and river basin in India .The River is almost 1400 km long. It is one of the major sources of irrigation for Maharashtra, Karnataka Telangana and Andhra Pradesh. Reaches the Bay of Bengal. Krishna water plays a key role in providing potable water, transportation, electricity, and dams' construction. Pushkaram is a festival of rivers pertains to 12 rivers in India which occurs once in 12 years. The Krishna Pushkaram held last time in the year 2004. During Krishna Pushkaram lakhs of people from all over the country took a dip and bath in the river Krishna. In the year 2016 from August 12th to 23rd lakhs of people from different places of the country too bath in the river. So in that time water quality is degraded due to anthropogenic activities. Water pollution affects the entire biosphere. In almost all cases the effect is being damaged not only to individual species and population but also the natural biological communities. The present study reveals how the Krishna water is contaminated during Pushkaram. Most of the years, the River water is not joining the sea due to full utilization of water mainly in Agriculture. Closed river basin of Krishna means that the River Ecosystem is on the edge of the death. The river receives the waste from several cities.

2.0 MATERIALS AND METHODS:

In the present study the samples were collected from different places or sampling stations of Vijayawada, Vedadri, Nagarjunasagar, Beechpally, Rangapur, and Alampur.

The samples were collected at 12 day's intervals from Aug 12th2016 to August 23rd 2016. Standard methods (APHA 1999) are used for sampling collection, preservation and estimation of chemical and microbial parameters like Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Calcium, Magnesium, Iron, Fluoride, Chloride, Total Dissolved Solids (TDS), sulphate, E-Coli (APHA 1999). One liter of samples was collected for chemical and microbial analysis from each station into pre sterilized bottles without air bubbles. All the samples are stored at low temperature which is less than 4°C and above freezing point. In order to minimize the volatilization or biodegradation between sampling and analysis, we kept the samples as cool as possible without freezing. In the present study for analyzing the iron in water, water samples were collected in a separate clean bottle and acidified with acid (Saksena, 2008).

3.0 RESULTS AND DISCUSSION:

Temperature: Temperature affects the dissolved oxygen percentage in water there by effects the aquatic life. Whenever temperature increases then BOD of water increases, change in taste, odor, color and corrosion.

Dissolved Oxygen (DO): the dissolved oxygen content of water is influenced by the source i.e., raw water temperature, treatment and chemical and biological processes taking place in the distribution system. Depletion of dissolved oxygen in water supplies can encourage the microbial reduction of nitrate to nitrite and sulphate to sulphide [WHO 2011]. In the present study the lowest value of D O is recorded on the 7th day i.e., 4.5 mg/lit at S1. Because of human activities during Pushkaram, D O decreases and is below the permissible limit. This lower value of D O affects the aquatic life. The variations in DO from August 12th to 23rd August are represented in table 1 and average variations in all stations are represented in figure 1.

Biological Oxygen Demand (BOD): if the D O of water decreases then consequently BOD of water increases. High value of BOD represents the water gets polluted. In the present study the highest value of BOD is recorded on 7thday i.e., 54.5 mg/lit at S1. This elevated BOD values represents lots of pollutants are discharged into the water by human activities during Pushkaram. The variations in BOD from from August 12th to 23rd August are represented in table 2 and average monthly variations in all stations are represented in figure 2.

Chemical Oxygen Demand (COD): The decreased in the D O of water increases the COD. This affects the aquatic life. In the present study the highest value of COD is recorded on 7th day i.e., 56 mg/lit at S1. This is due to anthropogenic activities during Pushkaram. The variations in COD from are represented in t from August 12th to 23rd August 2016 .Table 3 and average variations in all stations are represented in figure 3.

Calcium: The increase in concentration of calcium of water causes hardness. In the present study the highest value of calcium is recorded on 7th day i.e., 24.5 mg/lit at station S1 during Pushkaram. The variations in calcium from are represented from August 12th to 23rd August in table 4 and average monthly variations in all stations are represented in figure 4.

Magnesium: In the present study the highest value of magnesium is recorded on 7th day i.e., 146.7 mg/lit at station S1 during Pushkaram.

This leads to increase in the hardness of water. The variations in magnesium from are represented i from August 12th to 23rd August in table 5 and average monthly variations in all stations are represented in figure 5.

Iron: At levels above 0.3 mg/lit, iron stains laundry and plumbing features [WHO 2011]. In the present study the highest value of iron is recorded on 7th day i.e., 1.47 mg/lit at station S6 during Pushkaram. The variations in iron from are represented from August 12th to 23rd August table 6 and average monthly variations in all stations are represented in figure 6.

Fluoride: Generally high concentrations of fluoride ion in water cause dental fluorosis. In the present study the highest value of fluoride is recorded in the month of July 1.81 mg/lit at S1. The variations in fluoride from are represented in table 7 from August 12th to 23rd August 2016 and average variations in all stations are represented in figure 7.

Chloride: High concentration of chloride gives salty taste to water [WHO 2011]. The change in concentration of chloride ion influences the electrical conductivity and total hardness of water. In the present study the highest value of chloride is recorded on 7th day i.e., 78.5mg/lit at station S1. The variations in chloride from are represented in from August 12th to 23rd August table 8 and average monthly variations in all stations are represented in figure 8.

Table 1: variation in Dissolved Oxygen (DO) DO (mg/lit) samples

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	10.1	10.2	09.9	9.6	9.1	4.5	4.6	5.8	6.7	7.1	8.7
S2	10.6	10.8	10.1	9.9	9.2	5.1	4.9	4.85	6.1	6.1	8.1
S3	11.3	11.9	10.5	10.1	9.6	5.2	5.35	5.1	6.3	8.2	9.2
S4	13.2	12.1	10.2	9.8	5.9	5.6	5.3	6.4	7.5	8.5	9.5
S5	12.7	11.6	10.5	10.4	5.15	5.4	5.5	6.4	7.5	9.9	9.8
S6	13.1	1.2	12.2	11.3	10.5	5.2	5.8	5.5	6.5	7.89	9.9
AVG	47.7	51.8	51.4	58.4	58.5	75	98.1	99	81.6	69.6	53

Table 2: variation in Biological Oxygen Demand (BOD) BOD (mg/lit)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	5.31	11.9	12.8	12.9	39.65	54.5	45.6	22.8	16.6	10.1	15.1
S2	10.50	11.7	12.5	12.4	38.4	52.4	45.4	45.4	22.5	14.2	9.65
S3	4.70	10.3	01.4	12.2	01.9	35.1	49.4	45.2	22.1	14.2	9.70
S4	4.50	09.8	11.2	11.8	32.1	48.5	45.2	02.1	14.2	09.4	4.70
S5	4.30	9.10	10.3	11.8	11.2	29.1	45.6	40.2	21.5	13.5	8.90
S6	4.17	39.4	10.6	11.2	28.2	42.3	39.12	12.4	08.5	04.5	2.40
AVG	4.53	9.2	10.7	11.6	11.7	32.5	47.5	42.4	21.7	13.8	9.11

Table 3: Monthly variation in Chemical Oxygen Demand (COD) (mg/lit) samples

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day8	Day 9	Day 10	Day 11
S1	3.6	3.9	4.4	4.5	5.8	7.9	15.8	15.7	14.8	12.6	10.4
S2	3.3	3.5	3.8	4.3	9.6	7.6	14.9	15.2	14.6	11.8	9.8
S3	2.8	3.3	3.5	4.2	5.4	7.5	14.7	15.14	14.2	11.6	9.4
S4	2.7	3.2	3.3	4.2	5.1	7.4	14.3	14.8	13.8	11.1	9.1
S5	2.7	3.2	3.3	4.2	5.1	7.4	14.3	14.8	13.8	11.1	19.1
S6	2.6	3.1	3.4	5.0	7.2	14.1	14.7	13.6	10.9	9.0	5.6
AVG	17.8	18.8	19.2	16.7	17.4	18.8	2.6	23.2	23.4	18.1	16.6

Table 4: Daily variation in in Calcium (mg/lit) samples

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10	Day 11
S1	8.5	15.8	15.2	14.4	14.0	14.0	36.9	47.0	47.6	26.0	18.9
S2	8.3	15.3	15.1	14.3	14.1	34.1	46.6	45.9	24.5	19.1	14.2
S3	8.3	15.3	15.1	14.3	14.1	34.1	46.6	45.9	24.5	19.1	14.2
S4	8.1	14.4	14.1	14.2	13.5	31.3	44.3	43.2	25.9	18.5	14.1
S5	7.9	11.8	13.0	13.7	30.8	41.5	04.5	25.6	17.2	13.7	07.9
S6	7.5	10.5	01.5	01.5	12.8	27.3	39.8	42.1	24.8	15.9	13.4
AVG	8.36	14.3	14.4	13.8	13.9	34.5	46.4	45.1	25.6	18.6	14.2

Table 5: Monthly variation in Magnesium Magnesium (mg/lit) samples

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	71.4	64	64.7	85.5	100	133	147	142	111	98.1	86.5
S2	70.9	62.6	64.3	82.5	95.9	132	140	140	109	96.9	85.2
S3	64.4	59.7	65.1	81.0	98.5	128	132	136	106	94.3	84.4
S4	63.0	54.1	60.3	72.3	95.0	124	133	136	110	95.5	84.3
S5	59.7	48.7	54.1	76.1	88.8	119	130	133	93.7	93.6	79.2
S6	59.6	50.5	52.8	73.7	90.2	111	107	135	91.8	89.6	82.6
AVG	64.2	55.8	58.4	77	93.8	122	128	136	103	94	83.6

Table 6: Monthly variation in Iron Iron (mg/lit) samples

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	0.28	0.31	0.26	0.27	0.34	0.91	1.38	1.06	1.01	0.78	0.76
S2	0.26	0.25	0.24	0.28	0.35	0.89	1.41	1.16	0.91	0.81	0.77
S3	0.25	0.22	0.2	0.25	0.32	0.86	1.15	1.09	0.96	0.79	0.73
S4	0.21	0.21	0.21	0.25	0.31	0.87	1.29	1.13	0.98	0.83	0.75
S5	0.19	0.21	0.22	0.21	0.35	0.85	1.15	0.93	0.82	0.72	0.71
S6	0.2	0.2	0.23	0.3	0.33	0.88	1.47	1.04	0.89	0.81	0.74
AVG	0.23	0.23	0.23	0.24	0.3	0.87	1.3	1.11	0.95	0.8	0.75

Table 7: Monthly variation in Fluoride Fluoride (mg/lit) samples

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	0.11	0.23	0.18	0.31	0.56	0.78	1.81	1.63	0.94	0.72	0.41
S2	0.1	0.09	0.16	0.29	0.52	0.74	1.52	1.42	0.78	0.70	0.28
S3	0.08	0.18	0.15	0.27	0.51	0.72	1.33	1.21	0.69	0.32	0.27
S4	0.07	0.15	0.14	0.25	0.49	0.71	1.21	1.16	0.68	0.69	0.22
S5	0.07	0.15	0.14	0.22	0.47	0.69	1.12	1.05	0.57	0.56	0.27
S6	0.06	0.1	0.12	0.21	0.45	0.68	1.16	0.94	0.55	0.53	0.27
AVG	0.08	0.18	0.14	0.25	0.49	0.71	1.32	1.18	0.67	0.61	0.31

Table 8: variation in Chloride (mg/lit)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	29.1	31.6	33.5	34.6	34.4	66.4	78.5	72.2	58.6	54.3	52.6
S2	28.1	31.3	33.1	34.1	34.0	66.1	75.6	72.2	57.3	51.8	50.7
S3	27.8	30.1	32.6	33.8	33.9	64.5	74.2	71.4	57.1	51.2	50.1
S4	27.6	29.8	32.4	33.6	33.4	63.2	73.2	71.0	55.4	50.9	49.5
S5	27.5	29.6	32.0	32.9	33.1	62.1	73.4	70.3	54.8	49.7	48.3
S6	27.3	29.5	31.8	31.9	32.1	61.5	72.1	70.1	53.6	48.6	47.6
AVG	27.8	30.1	32.4	3.3	3.3	63.4	74.2	71	5.7	50.7	49.4

Table 9: variation in Sulphate (mg/lit)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	19.2	20.1	27.9	27.6	27.5	28.5	44.5	41.9	39.6	35.7	31.3
S2	18.6	19.8	25.3	24.5	25.4	28.7	43.6	41.1	38.5	34.2	32.1
S3	18.4	19.5	24.7	24.3	21.3	25.9	44.8	40.8	34.9	34.2	32.0
S4	19.4	18.3	21.6	20.4	19.5	24.3	44.0	38.9	36.5	35.1	31.9
S5	18.9	18.4	20.8	20.6	19.9	21.4	42.1	39.1	35.6	33.0	29.6
S6	17.6	17.4	21.5	20.7	19.1	21.0	41.9	37.8	35.2	30.9	28.5
AVG	18.7	18.7	23.8	2.7	21.8	24.4	43.4	39.8	36.4	34	31.6

Table 10: Monthly variation in Total Dissolved Solids (TDS) (mg/lit)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
S1	143	179	205	196	221	267	359	282	168	127	116
S2	139	166	154	164	204	260	331	260	163	125	116
S3	136	162	152	185	193	251	322	270	164	124	114
S4	125	132	150	154	189	257	274	253	159	120	111
S5	125	135	132	152	182	236	287	218	150	124	112
S6	121	139	139	158	187	248	296	254	142	116	110
AVG	129	150	151	168	192	251	312	254	154	122	113

Table 11: Daily variation in E-Coli E-COLI (colonies/ml)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10	Day11
S1	300	235	325	298	205	7500	1052	8500	7582	4985	3879
S2	345	225	305	265	219	6523	9548	7569	7124	4478	3478
S3	327	216	326	256	196	8569	7584	7214	4932	3632	1578
S4	347	195	347	269	194	3478	4257	4123	3569	1458	0965
S5	348	189	356	250	187	2485	4871	4578	1145	0895	0547
S6	354	206	327	275	189	1596	3247	3569	3120	1789	0765
AVG	334	215	339	267	197	4376	6324	5593	5047	2879	2067

Table 12: Physico-chemical and microbial standards of water given by WHO (2011), EPA (2001), BIS (2012).

S. NO	PARAMETER	WHO (2011)	BIS (2012)	EPA (2001)
1	Total Dissolved Solids (TDS) (mg/lit	600	500	-
2	Total Hardness (mg/lit)	200	200	-
3	Calcium (mg/lit)	300	75	-
4	Magnesium (mg/lit)	-	30	-
5	Do (mg/lit) - - - 8 Bod (mg/lit)	-	-	-
6	Bod (mg/lit)	-	-	5
7	Cod (mg/lit)	-	-	40
8	Total Alkalinity (mg/lit	-	200	-
9	Turbidity (NTU)	5	5	-
10	Fluoride (mg/lit)	1.5	1.5	-
1	Chloride (mg/lit)	250	250	250
12	Iron (mg/lit)	0.3	0.3	0.2
13	Sulphate (mg/lit)	250	20	250
14	E-Coli	-	-	-

Table 1: Average variation in Dissolved Oxygen DO (mg/lit) samples

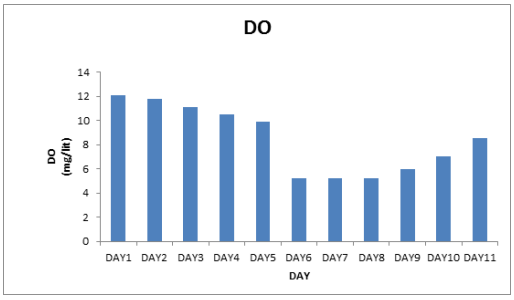


Table 2: Average variation in Biological Oxygen Demand (BOD) (mg/lit)

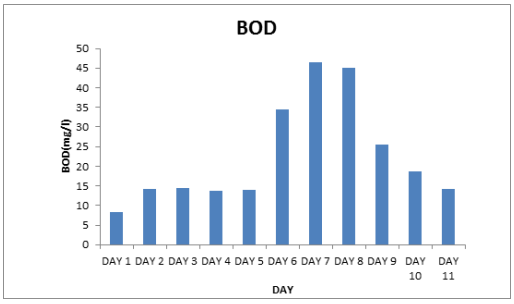


Table: 3 Average variation in Biological Oxygen Demand (COD) (mg/lit)

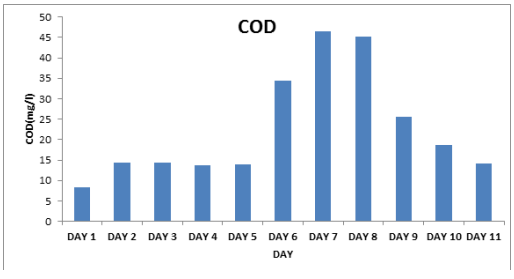


Table 4: Average variation in Calcium (mg/lit) samples

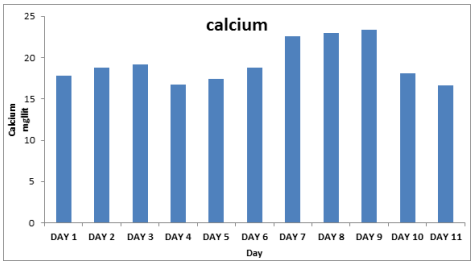


Table 5: Average variation in Magnesium Magnesium (mg/lit)

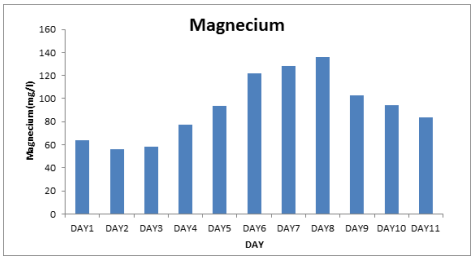


Table 6: Average variation in Iron (mg/lit)

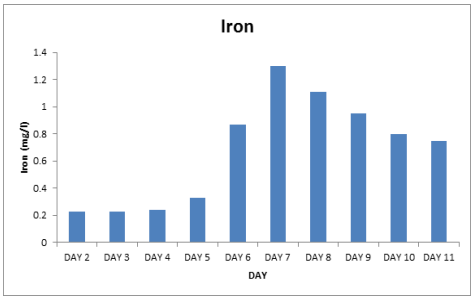


Table 7: Average variation in Fluoride (mg/lit)

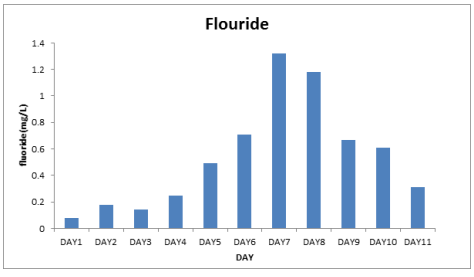


Table 8: Average variation in chloride (mg/lit))

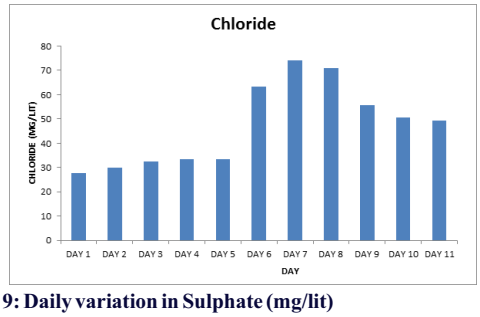


Table 9: Daily variation in Sulphate (mg/lit)

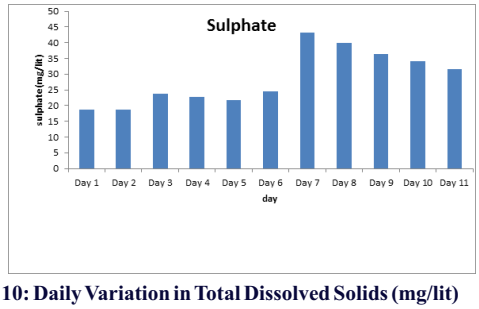


Table 10: Daily Variation in Total Dissolved Solids (mg/lit)

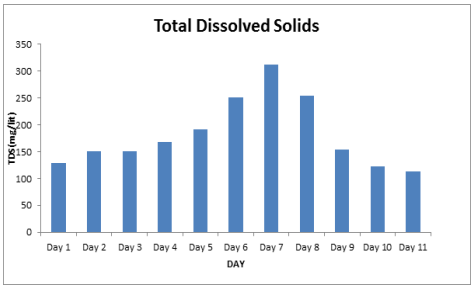
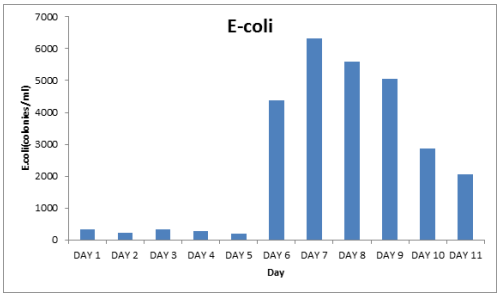


Table 11: Daily Variation of E-coli (mg/lit)



Total Dissolved Solids (TDS): TDS affects the taste of the water. Calcium, magnesium, chloride, sulphate etc. ions which are present in water is responsible for TDS. TDS also influence the conductivity of water. In the present study the highest value of TDS is recorded on 7th day, 359mg/lit at station S1 during Pushkaram. The variations in TDS from 12th August 2016– 23rd August 2016 are represented in table 9 and average monthly variations in all stations are represented in figure 9.

Sulphate: The presence of sulphate in drinking water can cause noticeable taste and very high levels might cause a laxative effect [WHO 2011]. In the present study the highest value of sulphate is recorded in the day 7th i.e., 44.8 at station S3. The variations in sulphate12th August 2016– 23rd August 2016 are represented in table 10 and average variations in all stations are represented in figure 10.

E-Coli: E-Coli provide conclusive evidence of recent fecal pollution and should not be present in drinking water [WHO 2011]. High number of E-Coli in water affects the human health. In the present study the highest number of E-Coli is recorded. 10,525 colonies/ml at station on 7th day at S1 during Pushkaram. This drastic increase is because lakhs of people took bath in the Godavari water during Pushkaram and discharge lot of pollutants into the water. The variations in E-Coli from are represent 12th August 2016– 23rd August 2016 ed in table 11 and average monthly variations in all stations are represented in figure 11.

CONCLUSION:

In the present study all the measured physico chemical and microbial parameters are compared with standard values given by world health organization WHO (2011), environmental protection agency EPA (2001), bureau of Indian standards BIS (2012) shown in table 18. There is a deviation of Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Turbidity, Calcium, Magnesium, Iron, Fluoride, Chloride, Total Dissolved Solids (TDS), sulphate from standard values during Pushkaram. But there is a drastic change in E-Coli which causes health problems. Due to different anthropogenic activities during Pushkaram there is a disturbance created in the chemical and microbial aspects of krishna water causes health problems and creates imbalance in water ecosystem.

REFERENCES:

1) American Public Health Association (APHA), (1999): Standard Methods for the Examination of Water and Waste Water.
2) Bureau of Indian Standards (BIS), Indian Standard Drinking Water- Specification (Second Revision), 2012.
3) Environmental Protection Agency (EPA) 2001, Parameters of Water Quality - Interpretation and Standard.
4) Environmental Protection Agency (EPA) 2001, Parameters of Water Quality - Interpretation and Standard, Conductivity PP.49.
5) World Health Organization (WHO), Guidelines for Drinking-Water Quality, Fourth Edition, Acceptability Aspects, 2011.