

Impact of Kumbha Mela Celebration on Water Quality of Sangam River, T Narasipura, Mysore District

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ABSTRACT

The Kumbha Mela is a large Hindu festival in India, held approximately once in every three years, by rotation. Mass Bathing, an old age ritual in India is one of the main causes for increasing organic pollution of the river. The study carried out the Kumbha Mela celebration caused the changes in the water quality of the river and indicated that the water is not fit for drinking or bathing purposes. This study involves determination of physical, biological and chemical parameters of surface water at different points. The river was found to be highly polluted in Kumbhamela season. The water was found slightly acidic. The mean values of parameters were Conductivity 75–995 μ s; BOD: 35.3 mg/L to 56.5 mg/L; COD: 203.1 to 256.4 mg/L; TDS: 192 mg/L to 228 mg/L; TSS: 10 mg/L to 45.2 mg/L. The BOD, COD and coliform concentration was found higher in the Kumbha mela season. A model study was also conducted and values of different model parameters were estimated.

Keywords: Kumbhamela, Physico-chemical, Kaveri river, Water quality.

INTRODUCTION

Water is one of the main essential components of all-natural resources available on earth. It is important to all living organisms, ecological systems, human health, food production and economic development (Postal et al., 1996). The fresh water is directly used many a times for various purposes such as drinking without treatment, bathing, noncontact recreational uses, public water supplies, industrial, agricultural, aquaculture and wildlife propagation, navigation and waste receiving

etc. (Sundararajan & Anand, 2011), But the clarity does not remain constant and varies from place to place in nature.

Polluted rivers are important vectors for the spread of diseases. Due water-borne diseases in developing countries 1.8 million children die every year. (WHO 2004). Bacteriological assessment particularly using coliforms, which are the indicators of contamination by faecal matter, is carried out to ascertain water quality and portability.

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Among various water quality indicators, the microbial indicators such as total coliforms, faecal coliforms and Enterococci are most commonly used (USEPA, 1999). And hence, the detection and enumeration of indicator organisms are of prime importance for the monitoring of sanitary and microbiological quality of water (Gunnison, 1999).

The Kumbha Mela is a huge renowned Hindu festival in India, held approximately once in every three years, by rotation. Kumbh Mela is a Yogi Convention, where yogis, sadhus (saints) gather and is attended by lakhs of people from across the world, irrespective of all worldly barriers of cast, creed and region. A huge temporary city is created for the millions of pilgrims that arrive for the most auspicious bathing days. During Maha Kumbh, millions of holy men and women (saints, monks and sadhus) take dip in holy river. Rituals of Kumbh Mela include religious discussions, devotional singing, and exhibitions. Kumbh Mela is the most sacred of all the Hindu pilgrims. The main bathing days are known as 'Maha snana' or 'Royal Bathing Days' on which main bathing ghat of Sangam river is reserved only for saints (Vijay Sharma, 2012).

This Mass Bathing, an old age ritual practised in India is one of the main causes for increasing organic pollution of the river and also inorganic wastes are accumulated at the river beds creating huge garbage. High amount of organic matter is flooded into the river water in form of soaps, detergents and washing of cloths. Out of the total domestic tourist, religious and pilgrimage tourist contributes only 13.8% (MOI/NCAER, 2002). Several studies have been directed on the impact of mass bathing on various water bodies in India (Sinha et al., 1991; Lal, 1996; Dhote et al., 2001; Chandra and Prasad 2005; Kulshreshtra and Sharma, 2006). Mass bathing at Triveni during Kumbha and Mahakumbh mela has attracted numerous scientists to study the water quality of the river (Upadhyay et al., 1982; S. K. Singh et al., 1988; J. P. Singh et al., 1988, 1989). It is a belief that a dip in "Holy River washes away you're sins".

Tirumakudalu Narasipura the temple city of Karnataka, commonly known as T. Narasipura or T.N. Pura, is a panchyath town in Mysore district, in the Indian state Karnataka. The first name refers to the land at the confluence, trimakuta in Sanskrit means uniting of three sacred rivers that is Kaveri, Kabini and Spatika Sarovara (a mythical lake or spring, also named Gupta Gamini). This is the place in South India where Kumbha mela is held once in every three years since 1989 in a grand scale where also the of devotees attending the kumbha mela celebrated in Allahabad and Nasik, visit the city and take a holy dip in the water. It finds a mention in the Skanda Purana as one of the Trimakuta Kshetras (holy places at the confluence of three rivers). The word 'Narasipura' is the name of the town, which is derived from the famous Gunja Narasimha Swamy temple that is located on the river bank of the Kabini. It is considered to be as sacred as Prayag (confluence of the Ganges, the Yamuna and the Saraswathi at Prayag – Varanasi - Kashi in North India), due to this it is a holy place of Hindus and is also known as Dakshina Kashi, where the town finds mention in tourism guides, both as a tourist place and a pilgrimage centre. Panchalinga Darshana is another prominent practise here. It is the visiting and seeking blessing of all pancha (five) lingas in one round trip. The Panchalingas include Parameswara Lingam and Someshwara in T Narsipur, Gargeshwara Lingam in the village of Gargeshwari, Agasthyeshwara and Hanuman Lingam.

Since, the mass ritualistic bathing is an age old phenomenon, which may occurs many times in a year across different parts of India and millions of peoples gather on such occasions. Therefore, the present study was conducted to investigate the effects of mass ritualistic bathing on the water quality of Sangam River and subsequent health effect on bather population, with the intention that a comprehensive health-based policy may be framed to initiate necessary action and preventions to control future consequences.

MATERIALS AND METHODS

Site Description

Tirumakudalu Narasipura the temple city of Karnataka, commonly known as T. Narasipura or T.N. Pura, which is a panchyath town in Mysore district in the Indian state, Karnataka. The first name refers to the land of confluence, (trimakuta in Sanskrit means the confluence of the rivers Kaveri, Kabini and Spatika Sarovara (a mythical lake or spring, also named Gupta Gamini).

The water samples were collected from different sampling points that is SAMPLE -1 (Kabini), SAMPLE -2 (Kaveri) and SAMPLE -3 (Spatika Sarovara) which is because the people take Holy bath and performs rituals at these three different river beds.

Sample collection

Water sample from the sample collection points were collected on main bathing dates during mass bathing period and the parameters were analysed by the standard methods.

Physicochemical parameters

The physic-chemical analyses were carried out as per standard methods [1, 10]. The, pH by pH meter, electrical conductivity (EC) by EC Meter, temperature by thermometer, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD) winkler's method and open reflux method, total hardness, alkalinity by EDTA titration method and volumetric method, total dissolved solids (TDS), total suspended solids (TSS) done by open evaporation method, Sodium and Potassium is done by flame photometric method, Nitrite and Fluoride by spectrophotometric method, Chloride by silver nitrate method and Microbiological test were measured.

Out of these parameters Temperature was analysed in the field and DO were determined without any delay upon persistent to the laboratory and pH, Conductivity, BOD, COD, Hardness, alkalinity, Sodium, Potassium, TDS, TSS, Nitrite, Fluoride, Chloride were determined in the research laboratory using the given methodologies of (APHA).

RESULTS AND DISCUSSION

The temperature of all the samples were found to be between 28 to 30 degree centigrade. The temperature may vary from place to place because of different climatic conditions and the place of storage. TDS on the day of mass bathing showed higher amount between 192-228mg/L at the three sampling points. But these are within the permissible limits. This may be due to the contamination of water source by the mass bathing. The maximum amount of TSS as recorded on the second day i.e., on the day of mass ritualistic bathing between 10- 45.2mg/L at all the three sampling points. The water samples which are tested for pH are within the prescribed range of 6.5 to 7.92. All the samples at all the days showed the conductance within the prescribed limits of 1000 mS / cm. All the samples showed the Alkalinity within the permissible limits but on the day of mass bathing, the Alkalinity is more i.e., 330-430 mg/L within the range at all the three sampling points.

All the samples showed different amounts of hardness. But on the day of mass ritualistic bathing the hardness is high between 110-175mg/L. The samples at three different sampling points showed the amount of calcium and magnesium in the water within the limits, but the chloride content on the day of kumbha mela showed higher amount i.e., 88.04mg/L when compared to before and after the kumbha mela which was due to the releasing of chlorine containing chemicals such as bleaching powder etc.

The nitrite tested for all the samples were within the 0.120-0.224mg/L limits in all the 3 days of sample collection, but on the day of mass bathing the sodium concentration is high which is because of the dissolution of soaps and detergents in the water. The sodium concentrations lie between 90-180mg/L. The concentration of potassium on the day of Kumbha Mela is higher i.e., 15-40mg/L which is above the permissible limits at the sampling points 2 and 3. The other samples before and after the Kumbha Mela have the potassium content within the limits. The samples analysed for before, on the day and after the

Kumbha Mela showed the concentration of fluoride to be above the permissible limits i.e., 1-2.5mg/L.

The samples tested for the dissolved oxygen are below the limits due to the pollution caused by mass ritualistic activities in the water. The results obtained between 2.5-4.54mg/L is slightly similar to the results obtained during the study of water quality of river Kshipra at Ramghat, during mass bath, Ujjain. (Bhasin et al., 2015). On the day of

mass bathing the BOD is more between 35.3-56.5mg/L as compared to other days i.e., before and after the day of Kumbha Mela. The samples analysed for COD showed different amounts on different days and different sampling points. Out of this the COD is more in the samples on the day of Kumbha Mela i.e., 203.1-256.4mg/L.

CFU / mL of water which clearly indicates that the water is contaminated mostly by faecal coliforms.

A table showing the amounts of Physico-chemical and biological parameters of the water

SL no	Parameters	Before D1 10th February			On the day D2 17th February			After D3 24th February		
		S 1	S 2	S 3	S 1	S 2	S 3	S 1	S 2	S 3
1	Colour and odour									
2	pH	7.89	7.92	6.74	7.18	7.41	7.45	7.55	7.83	7.83
3	Conductance	79.04	109.4	112.4	79.04	118.5	118.5	85.12	115.5	115.5
4	TSS mg/L	19.2	47.2	18.21	45.2	44	10	10.8	16.8	40.41
5	TDS mg/L	24	24	20	204	192	228	28	12	16
6	Total alkalinity mg/L	311	310	280	430	320	330	280	270	310
7	Hardness mg/L	108	150	158	110	164	175	110	157	159
8	Calcium mg/L	20.04	38.4	42.4	21.6	34.4	34.4	18.4	36.07	40.08
9	Magnesium mg/L	21.46	27.23	28.20	27.00	31.62	34.30	22.35	29.52	29.01
10	Nitrite mg/L	0.116	0.128	0.134	0.206	0.214	0.224	0.132	0.120	0.170
11	Chloride mg/L	63.9	61.06	62.48	72.42	88.04	80.94	68.16	85.2	63.9
12	Sodium mg/L	20	26	23	90	80	120	45	50	62
13	Potassium mg/L	5	6	4	15	22	40	10	12	14
14	DO mg/L	4.56	4.32	4.51	3.0	3.21	2.5	3.75	3.68	3.83
15	BOD mg/L	36.2	35.3	36.1	53.1	53.8	56.5	42.3	40.4	41.5
16	COD mg/l	140.1	138.0	146.2	203.1	220.8	256.4	156.3	149.4	162.9
17	Fluoride mg/L	1	1.5	1.5	1	0.0	1	0.0	1.5	1.5
18	Temperature 0 C	28	28	30	30	28	30	29	28	29
19	MPN cfu/MI									

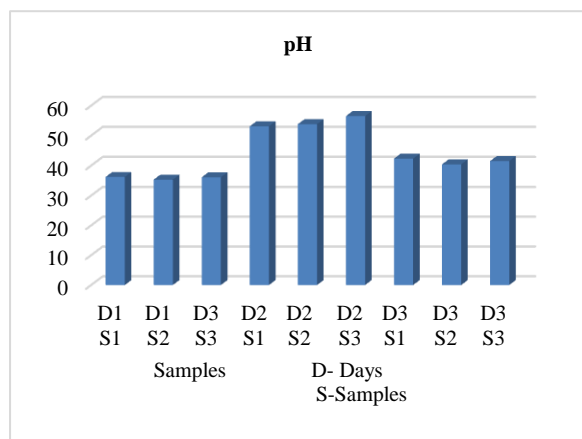


Fig. 1: variation in pH on different days

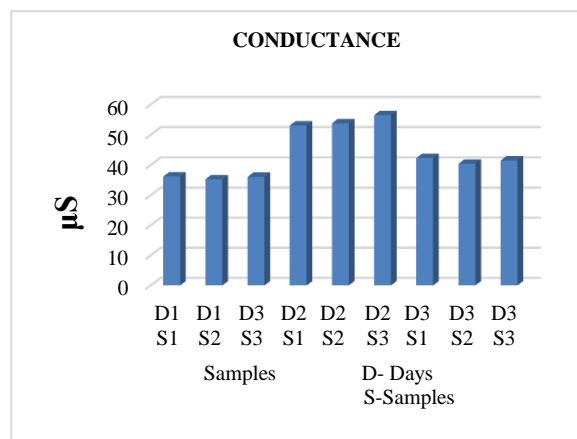


Fig. 2: variations in conductance on different days

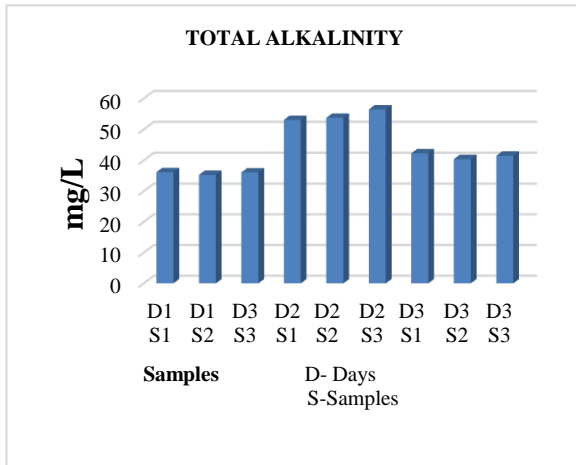


Fig. 3: variations in Total alkalinity on different days

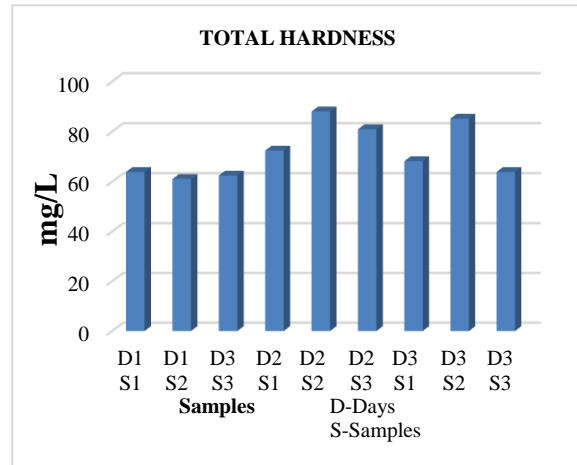


Fig. 4: variations in total hardness on different days

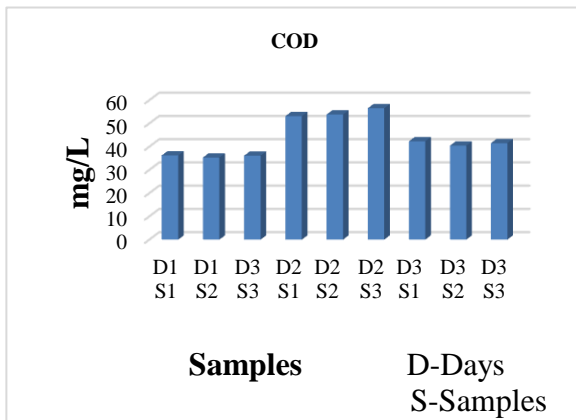


Fig. 5: variations in COD on different days

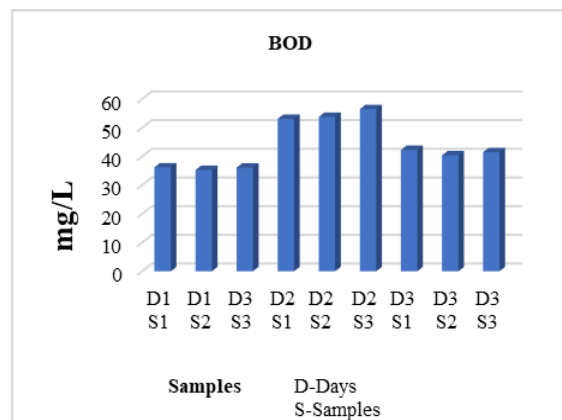


Fig. 6: variations in BOD on different days

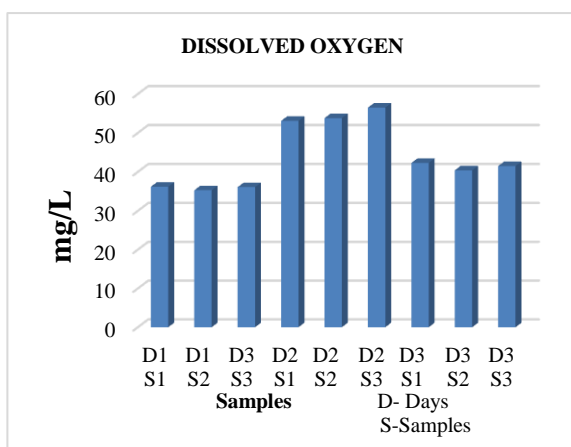


Fig. 7: variations in DO on different days

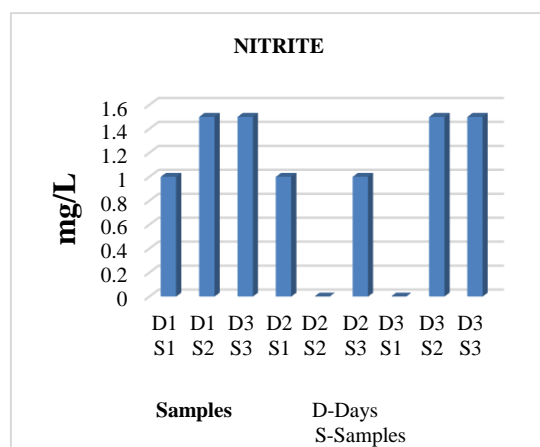


Fig. 8: variations in Nitrite on different days

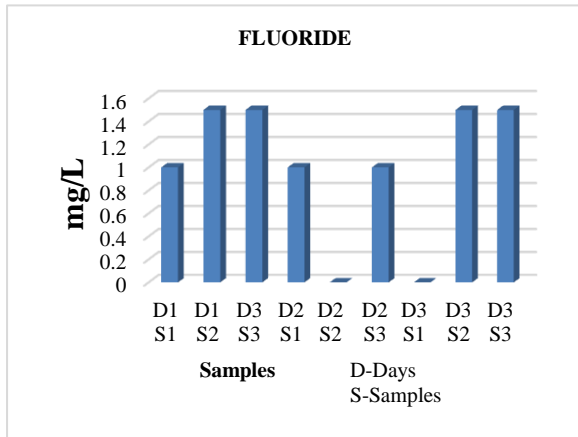


Fig. 9: variations in Fluoride on different days

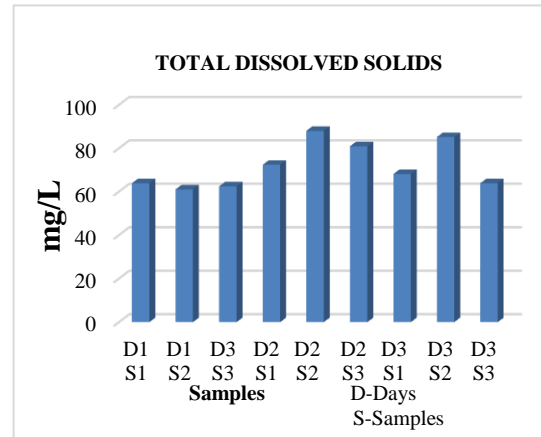


Fig. 19: variations in TDS on different days

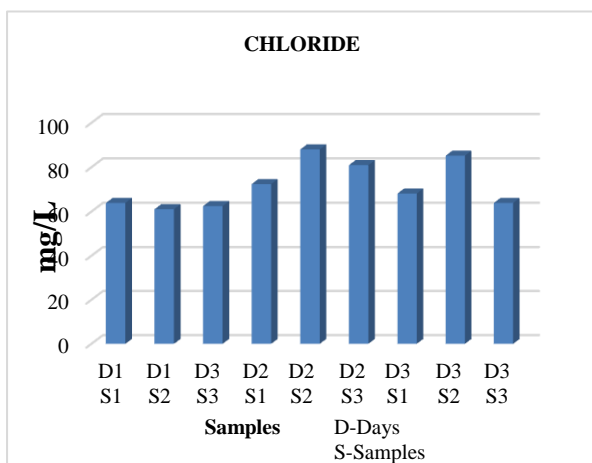


Fig. 11: variations in Chloride on different days

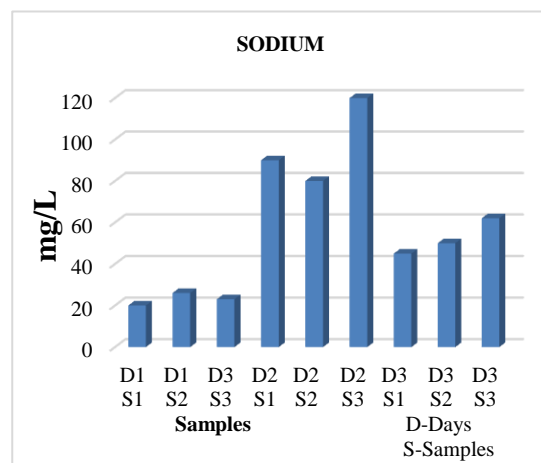


Fig. 12: variations in Sodium different days

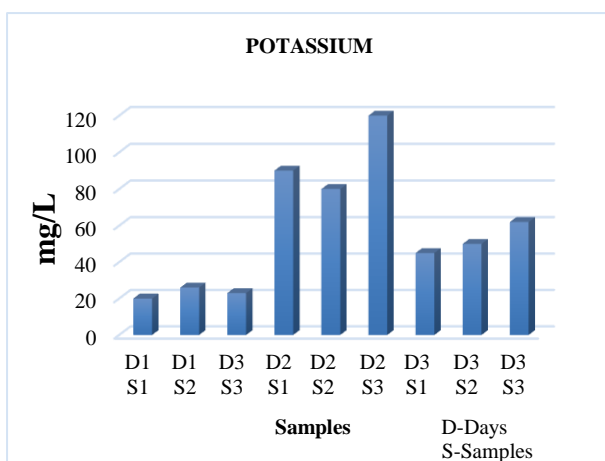


Fig. 13: variations in Potassium on different days

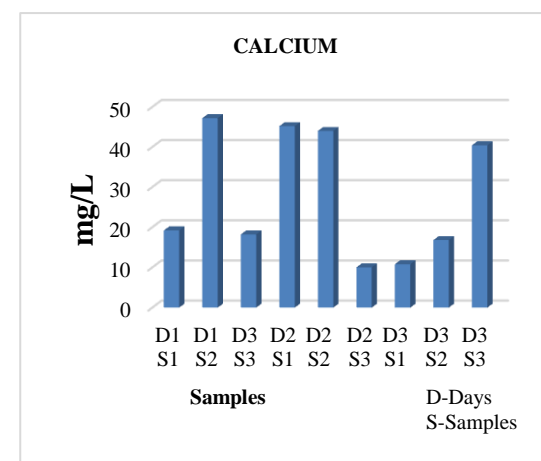


Fig. 14: variations in calcium on different days

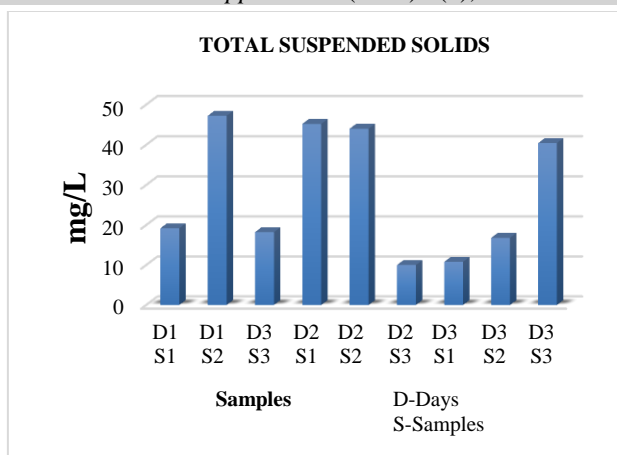


Fig. 15: variations in TSS on different days

CONCLUSION

The present study is directed to assess the water quality during Kumbha Mela 2019 held in T Narasipur for 3 days 17th, 18th and 19th of February 2019. It may be concluded from the present study that mass bathing causes a observable and major change in the physico-chemical and microbiological quality of river water (Tyagi et al., 2013).

The number of devotees visiting the river per day was directly proportional to the degree of contamination. The devotees carry out some religious activities such as taking Holi bath, immersing some degradable and non-degradable materials into the river water which leads to the contamination of water. This may pose health hazards such as diarrhoea, dysentery and intestinal problems. It also disturbs Environmental conditions such as salinity, oxygen, temperature and nutrients which influence the composition, distribution and growth of its biota. And hence it is necessary to take proper care of river in order to ensure the healthy maintenance of the temple and its surroundings.

The results found out from all the samples showed high amount of variations in all the parameters. The day of mass ritualistic bathing i.e., on the day of Kumbha mela showed a greater amount of BOD, COD, Coliforms, because of the addition of salts and chemical substances into the river. So, water in these areas is more prone for microbial contamination and pollution.

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