

**IMPACT OF SANT MUKTABAI FESTIVAL ON WATER
QUALITIES IN STRETCH OF RIVER TAPI AT
MUKATAINAGAR, MS, INDIA**

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A B S T R A C T

The present investigation was carried out to assess the impact of Muktabai festival at Muktainagar on river Tapi back water during Feb. 2012. The purpose of collection of water sample was to know the impact of festival activities on water bodies. Physico-chemical parameters of Tapi water were assessed including total Coliform, faecal Coliform with IMViC tests. The presence of faecal coliforms in water also hints at the potential presence of pathogenic microorganisms, which might cause water borne diseases. The results indicate that Tapi water was highly polluted at the time of Muktabai festival, the values of BOD and COD exceeded the maximum permissible limit. In view of the observed changes in the water quality, there is need to aware masses to use eco-friendly material for festival so that culture and environment can be preserved in a cohesive manner in nearby river Tapi area at Muktainagar.

KEYWORDS: Muktabai festival, Tapi River, Physico-chemical parameters, MPN, Muktainagar.

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INTRODUCTION:

Muktainagar (earlier known as Edlabad) is a small town situated (~21°03'08"N 76°03'18"E) on National Highway No. 6 and now become the Ashian Highway 46 (AH-46) at the northern border of Maharashtra in India. Muktainagar is famous for its association with Muktai, younger sister of saint Dnyaneshwar, who attained Samādhi on the banks of Tapi River at a place called Mehun (15 km from Muktainagar). Indian Vedic scriptures have described in detail the origin of water, its importance, quality and conservation. The medicinal aspect of water has been discussed in "Rig-Veda" and "Atharva Veda". When the flowers and other organic matter are immersed in the water body at the time of festival, these components lead to change in the water quality Gaikwad *et. al.* 2004. The biological phenomenon fully because the chemistry of water reveals much about the metabolism of the eco-system and explain the general hydro-biological relationship. The physico-chemical parameters of water and the dependence of all life process of these factors make it desirable to take as an environment. Since, it is a dynamic system containing living as well as non living, organic, inorganic, soluble as well as insoluble substances. So its quality is likely to change day by day and from source to source. Any change in the natural quality may disturb the equilibrium system and would become unfit for designated uses. Water is one of the most important compounds to the ecosystem.

Similar type of work has been carried out by various workers *i.e.* Bajpai *et. al.* 2002; Mukerjee, 2003; Swain *et. al.* 2005; Vyas *et. al.* 2006; Vyas *et. al.* 2008; Vyas and Bajpai, 2008; Gaikwad and Thorat, 2006; Dhote and Dixit, 2011 and Bhat *et. al.* 2012). The water quality deterioration in Tapi River due to such activities has been studied previously by Variya (2010), Varsani (2010), Malik *et. al.* (2010), Azahar (2011), Chaitali (2011), Ujjania and Azahar (2011) and Malik *et. al.* (2012).

The overall impact has resulted in deterioration of water quality, accumulation of toxic chemical and sediments, shrinkage of river area and above all a loss of aesthetic value. Muktainagar is famous for its association with Muktabai, younger sister of Saint Dyaneshwar, who attains

Samadhi on the banks of Tapi river. According to officials of civic body nearly 2000 to 2500 tons of flowers and other organic material contribute pollution load in the river Tapi.

MATERIALS AND METHODS:

Every year religious activities like Muktabai festival held in Muktainagar place which affect the water quality of back water of River Tapi. In this context, we have carried out our study to observe the impact of Nirmalya in river Tapi back water area which is situated near by the temple. Samples collected from the sites are denoted as S₁, S₂, S₃ and S₄. Sites were selected in river Tapi near Muktabai temple is as follows: - S₁ Tapi river water upstream, S₂ Tapi river water downstream, S₃ Tapi river water (Near temple area), S₄ Tapi river back water, Muktainagar. Samples were collected in plastic bottles as per standard procedure. During the entire study period analysis were carried out and each parameter analysis is the average of three readings respectively. The physico-chemical parameters were analyzed by APHA, 2005.

Total coliforms: Five test tubes containing 10 ml of double strength lactose broth and 10 test tubes containing single strength lactose broth with Durham's tubes were taken. The collected water samples were inoculated in each lactose broth tubes *i.e.* 10 ml water sample was inoculated into each five tubes containing 10 ml double strength lactose broth, 1 ml water sample was inoculated into five tubes containing 5 ml single strength broth and 0.1 ml water sample inoculated into each 5 tubes containing 5 ml single strength lactose broth. All the test tubes were incubated at 37 °C for 24-28 hr. After incubation, all the tubes were observed for acid and gas production. The production of acid and gas indicated the presence of coliforms and thus test was considered positive.

Faecal coliforms: EC broth was inoculated with loopful of inoculants from positive MPN tubes for coliforms form above experiments and after incubation (45 °C for 24 hr) results were taken. Differentiation of coliforms (IMViC Tests): The IMViC reactions ++ -- and -- ++ designated E.coli. The methyl red reaction is the most consistent for E. coli. Combination + -- -- also represented faecal origin contamination. If IMViC is -- ++ and + - + +, it represented

Enterobacter aerogens. Combination - - + - and - - - - + also represented soil origin contamination. - + - + and + + - + combination represented intermediate groups. All are methyl red positive and Voges Proskauer (VP) negative. Most are citrate positive while indole production varies. Other possible combination falls in irregular groups showing different pollution sources. IMViC tests were only performed for those samples, which showed some values of MPN/100 ml of coliforms.

Table 1: Showing water Sample from Changdev Temple back water of Tapi, Muktainagar, during Feb. 2012.

Parameters	S ₁ Tapi river water upstream	S ₂ Tapi river water downstream	S ₃ Tapi river water (Near temple area)	S ₄ Tapi river back water, Muktainagar
pH	6.8	7.2	6.9	7.1
Temp.	28°C	29°C	32°C	30°C
DO	5.7	6.1	6.9	6.3
TSS	35	88	93	159
TDS	2150	1840	3220	3810
TS	2185	1928	3313	3969
COD	118	109	290	320
BOD	105	110	185	170
Hardness	73.69	123.63	143.46	212.2
EC	0.12 ± 0.008	0.12 ± 0.08	0.14 ± 0.07	0.016 ± 0.06
Sodium (mg ^{l-1})	-1.60	-1.48	-1.79	-1.96
Mg	38.12	31.11	44.00	59.6
Calcium	35.57	92.52	119.46	152.60
Carbonate	--	--	--	--
Chlorides	49.33	34.44	86.20	94.40

Table 2: Showing Average SD of the parameter assess during Muktabai festival at Muktainagar during Feb. 2012

AVERAGE SD ±	
DO	7.60 ± 0.23
pH	7.47 ± 0.12
EC	0.16 ± 0.00
Sodium	-1.79 ± 0.41
Magnesium	44.30 ± 11.94

Calcium	11.71 ± 9.86
Carbonate	NIL
Bicarbonate	106.46 ± 3.16
Chlorides	38.41 ± 7.64

Table 3: Showing the effect on total Coliform and faecal Coliform in organic matter present at Muktainagar back water of Tapi collected from sampling sites during Feb. 2012.

Parameters		S ₁	S ₂	S ₃	S ₄
Total Coliform (MPN)	Before Dip	210	1120	326	500
	During Dip	>1600	>1600	>1600	>1600
Faecal Coliform (MPN)	Before Dip	>35	22	18	20
	During Dip	1600	>1600	160	>25

Table 4: Showing the differentiations in Coliform at Muktainagar, during Feb. 2012.

Parameters		S ₁	S ₂	S ₃	S ₄
IMViC Test	Before Dip	---	+++	---+	---
	During Dip	---	---	+++	+++

Results and Discussion:

The physico-chemical parameters were assessed during the time of Muktabai festival at Muktainagar is presented in table 1 and average SD of the parameter shown in table 2. Water pollution not only changes the physical properties of water but also makes it acidic, alkaline or saline due to the present of dissolved and suspended substances. The pH value of water samples of all four sites were within the standard limits. Observed pH values ranged from 6.8 to 7.1 at all sites. Temperature rise during festival season activities was minimum temperature recorded was 28°C where as maximum temperature was 32°C. Hardness of water samples is useful parameter to determine usefulness of water in different sectors, which was noticed comparatively higher at S₃ and S₄ site during the festival. Conductivity is the measure of capacity of a substance or solution to conduct electric current. There was wide variation of conductivity at different sites of Tapi River. The maximum value was recorded as 38.80

$\mu\text{mho/cm}$ and the minimum value was found to be $14 \mu\text{mho/cm}$. Water having conductivity more than $20\mu\text{mho/cm}$ is not suitable for irrigation. So the results indicate the river water at S_3 and S_4 site are highly polluted.

Dissolved Oxygen in water is of great importance to all aquatic organisms and is considered to be the factor that reflects the biological activity taking place in a water body and determines the biological changes. From Table 1 a significant observation comes out in respect of Dissolved Oxygen (DO) of the water samples of Tapti River at Muktainagar. The values ranged from 5.7 to 6.9 mg/l, which were below standard limits (ISI-6 mg/l, 1991) ISI, 1991. Biochemical Oxygen Demand (BOD) was noticed comparatively higher in S_3 and S_4 as compare to S_1 and S_2 site i.e. 185 and 170mg/l & 105 and 110 mg/l respectively. This is because the organic discharge into the water had not dissolved when sampling was done. But still these values are higher than the maximum permissible limits of WHOM, 1968. The higher values of BOD mean presence of more biodegradable organic material ICMR, 1975. BOD more than 6 mg/l indicates that the river water is highly polluted. The higher values of BOD have direct correlation with increase in nutrient level of the river water due to immersion activities, Mc Coy and Olson, 1986. COD was noticed comparatively higher S_3 , S_4 sites i.e. 290 and 320mg/l as compare to S_1 and S_2 i.e 118 and 109 mg/l respectively. Which shows that water is became highly polluted because of the activities carried out near temple and river Tapi back water area of Muktainagar. The maximum permissible limit for drinking water is 150 mg/l, ISI, 1991. Rests of parameters are well within the limit as presented in table 1. Most probable number (MPN) of coliforms measures the degree of coliforms in 100 ml of water. It is generally believed that more is the most probable number of coliforms, higher is the extent of pollution in a given sample. It is evident from the data presented in Table 3 that the MPN of coliforms ranged from 210 to 1600 per 100 ml in water samples collected before the dip. The highest MPN i.e. 1600 per 100 ml were recorded in all four samples i.e. S_1 to S_4 . Results of present studies are in close conformity to the findings of Masrrat and Thorat, 2000; Bhadra *et. al.* (2003); Gaikwad *et. al.*, 2007 who have performed the total coliform tests on different water bodies and noticed heavy bacterial contamination. The

faecal coliforms are used as an indicator of human enteric pathogen for many years. It is well established that *E. coli* is not limited to humans but also exists in the intestine of many warm-blooded animals (Orskov and Orskov, 1981). Therefore, its presence in water is not restricted to human source of pollution. Consequently faecal pollution can degrade water quality and restrict its use for drinking and recreational activities. Similar picture was observed in the present study where the faecal coliform population was found to increase after the dip. The faecal coliform ranged higher at all sites as presented in table 3. Human activities and sewage overflows may be the main reason behind higher faecal contamination in river Tapi.

Masrrat and Thorat, 2000 and Bhadra *et al.*, 2003 have also examined the presence of faecal coliforms as indicators of faecal pollution in various water bodies. The present study draws support from the findings of these workers. The samples S₁ to S₄ showed the presence of faecal coliforms which might be due to faecal discharge of diseased person or worm blooded animal which might have entered the Tapi water during the dip or it might be due to sewage contamination. Similar studies have also been carried out by Erwine and Pettibone (1996); Moustafa *et al.* (1997) and Masarrat *et al.*, (1999). The overall results of the water sample assessed during Muktabai festival nearby river Tapi may be due to big discharge of sewage and other material dump in large amount into the water body.

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