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Impact of fabric dyeing effluents on the physical parameters of Wunna river in Wardha district of Maharashtra

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Abstract

The physical parameters like temperature, odor, electrical conductivity, turbidity and pH of Wunna River in Maharashtra (India) at three different stations (upstream region- S_1, effluent mixed region- S_2 and 700 m away from effluent mixed region-S_3) were studied during the pre, mid and post-monsoon season. Marginal variations were recorded in temperature and turbidity while rigorous effect of effluent discharge on odor, electrical conductivity and pH was observed at the effluent mixed region as compared to the other stations. The flow of water in the river in different seasons was found to be an important factor responsible for variable impact of pollution. The data analysis confirms a great extent of pollution of the riverine eco-system at the site of release of textile industry effluents.

Keywords:- *Analysis, Eco-system, Pollution, Textile industry effluent, Wunna river*

Introduction

Rivers are the lifeline of living beings as a source of drinking water and fish culture. There are 14 major rivers in India that share 83% of the total drainage basin and contribute 85% of the total surface flow (Chaudhari, 1982). Water used by the consumers must be free from microbial contamination, toxic substance and excessive amount of minerals and organic matter (Godi *et al.*, 2003). The pollution of water may be attributed to anthropogenic activities like rapid industrialization, urbanization and improper waste management techniques (Rao and Rao, 1995; Todd, 1995, Ranga Raj *et al*, 1996).

The effluents of one of the textile industries involved in fabric dyeing are being released in Wunna river. At the moment, very scanty information on study of physical parameters of Wunna river is available. Hence to know the changes in physical parameters of the river due to release of industrial effluents, the present investigation was undertaken.

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Materials and Method

Wunna river

It originates from Pilkapar rows of Mahargarh valley in Tahsil Katol, District Nagpur of Maharashtra State. The latitude of the river is 20°32'58", the longitude is 78°49'00" and altitude is 214.2 metre. It is the main tributary of river Wardha that joins the Pranhita river which ultimately flows into the Godavari river. People residing in the vicinity of Wunna river heavily depend on it for drinking and other domestic purposes.

Study stations

Water samples from three stations of the Wunna River were collected monthly from Station-1 (upstream region), Station-2 (effluent mixed region) and Station-3 (700 m away from effluent mixed region) during June 2007 to March 2008 between 10 A.M. to 11 A.M. The samples were collected 2 meter away from the bank and 0.3 meter below surface to prevent the surface micro layer.

Sample collection and analysis

The samples were collected in pre-cleaned plastic bottles. The spot tests for temperature and pH were done instantly after collection of samples at the sampling sites. The samples were brought to the laboratory and stored at 4 °C till the analytical work was carried out. The physical analysis of samples were undertaken as per American Public Health Association (APHA, 1989) and Bureau of Indian Standards (IS-3025).

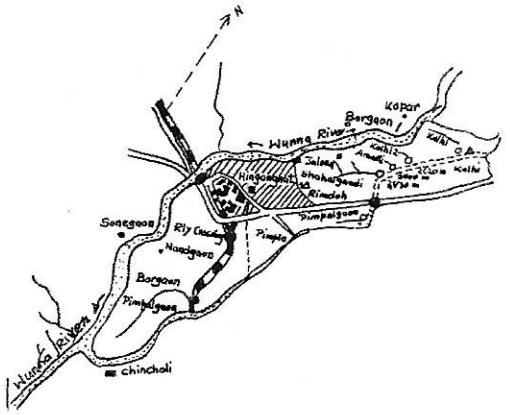

Fig. 1: Location Map of River Wunna at Hinganghat

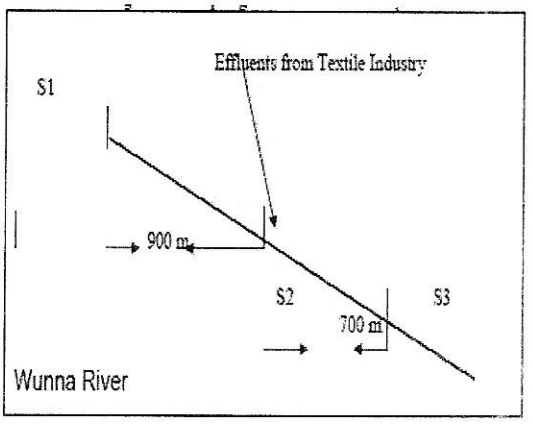

Fig. 2: Sampling locations in the study area

Results and Discussion

The physical analysis of samples of three different locations distribution of these parameters for the three stations of the river was analyzed using descriptive statistics and the results are given in the following table.

Table 1: The mean and SD values obtained for different parameters

Parameter	WHO standards	Mean and SD value		
		Station-1	Station-2	Station-3
Temperature(°C)	--	25.05±3.45	25.67±3.82	25.24±3.50
Electrical conductivity (µS/cm)	750-2000	426.80±91.94	2739.40±827.02	499.70±97.12
Turbidity(N.T.U.)	5-10	50.70±4.52	46.10±2.38	51.70±3.16
pH	6.5 -8.5	7.79±0.25	7.95±0.37	7.85±0.15
Odor	UO	UO	O	PO

The present study was undertaken to evaluate changes in the river water temperature along the course of Wunna River, the changes in the recorded levels of temperature are presented in Table 1.

Temperature: The maximum temperature recorded at station 1 was 30 °C in the month of June 2007, while minimum temperature 20 °C recorded in the month of December 2007. At station 2, the maximum temperature recorded was 31.4 °C in June and July 2007 while minimum temperature was 21.1 °C in the month of December 2007. For station 3, the maximum temperature recorded was 30.4 °C in the month of June 2007 while the minimum temperature recorded was 20.2 °C in the month of December 2007 (Fig.-3). The rise in temperature at effluent mixed region may be attributed to the heat generated by the effluents.

Electrical Conductivity: Table 1 provides variations in EC at all the stations study. At station 1, maximum conductivity recorded was 545 µS/cm in the month of October 2007, while minimum value recorded was 308 µS/cm in the month of June 2007. Station 2, maximum value recorded was 4580 µS/cm in the

month of August 2007, while minimum value recorded was 1814 µS/cm in June 2007. At station 3, maximum value recorded was 609 µS/cm in the month of December 2007 and minimum value recorded was 354 µS/cm in June 2007(Fig. 4). The maximum value recorded at station-2 is well above the maximum permissible limit stated by WHO.

Turbidity: The variations in the turbidity (NTU) levels estimated at all stations was presented in table 1. At station 1, the maximum value of turbidity recorded was 58 N.T.U. in July 2007, while minimum value recorded was 43 N.T.U. in February 2008. For station 2, maximum turbidity observed was 50 N.T.U. in June and July 2007, while minimum turbidity observed was 43 N.T.U. in June 2007. For station 3, the maximum value of turbidity recorded was 53 N.T.U. in the month of August 2007 and December 2007 while minimum turbidity observed was 46 N.T.U. in February2008 (Fig. 5).

pH: At station 1, the maximum pH value recorded was 8.4 recorded in the month of June 2007. While minimum value recorded were 7.5 in the month of January 2008. For station 2, the maximum pH value recorded was 8.68 in July 2007, while minimum value recorded was 7.46 in the month of March 2008. For station 3, the maximum value of pH recorded was 8.2 in the month of June 2007, while minimum recorded value of pH was 7.71 in the month of July 2007(Fig. 6). The values of pH at the study stations clearly indicate the alkaline nature of water. Maximum pH value recorded at station -2 exceeds WHO permissible limits.

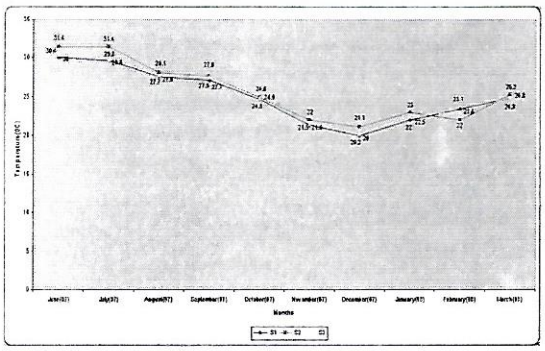

Fig. 3: Temperature recorded at different stations

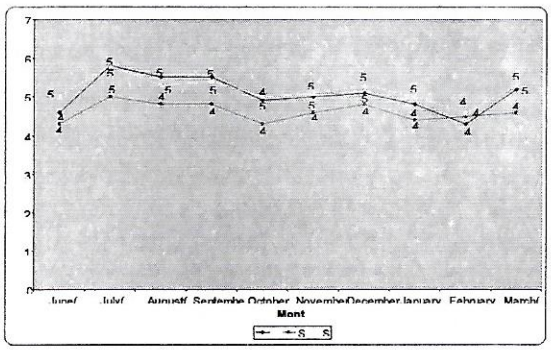

Fig. 5: Turbidity (NTU) recorded at different station

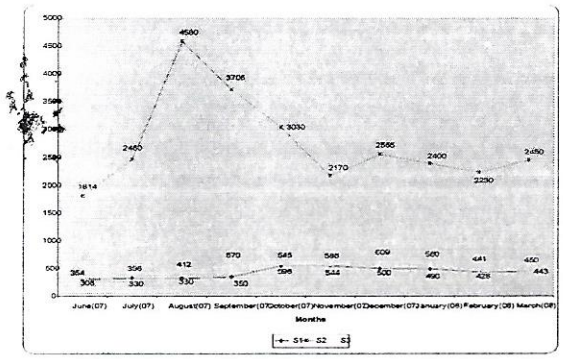

Fig. 4: Fluctuation in electrical conductivity (µS/cm) recorded at different stations

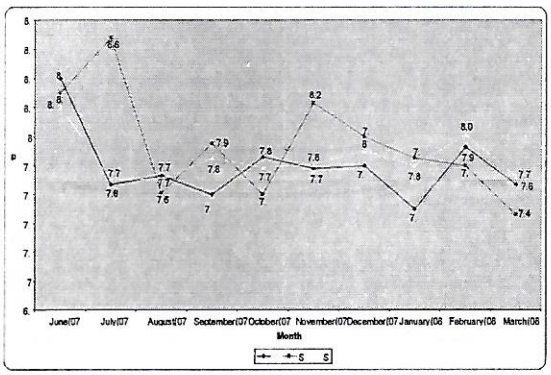

Fig. 6: pH recorded at different stations

Conclusion

The discharge of textile industrial effluents into the Wunna river is known to alter the hydrographical parameters at different levels in the stations studied. Textile industrial effluents influx in to the river may be considered as pollutant added to the river water thereby imparting bad odour along the course of the Wunna river at site-2 of the study area. As a result of this water of station-2 (S-2) has become unsuitable for drinking. These tremendous changes in the hydrography of the Wunna river could be expected to exert deleterious effects on the river ecosystem along the course of the down stream.

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