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Assessment of water quality in the vicinityof Municipal water pumping station, of river Wainganga at Pauni, District-Bhandara (Maharashtra)

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ABSTRACT

Present study deals with the pollution of Wainganga river at municipal water pumping station with special emphasis on the pollutants originated from the human domestic activities and wrong way of agricultural practices. As Large amount of organic pollutants enters in the river flow that alters the water quality parameters. The effect of pollution mainly comes in sight during summer season. It increases the temperature of water, lowers the dissolved oxygen contents, increases the biochemical oxygen demand, total dissolved solids, ionic contents and resulted in eutrophication of the river water. The daily input of organic pollutants in river water by human domestic practices on the bank of river, such as washing of utensils, cloth washing, cattle washing on the bank of river, deteriorate the river water. During summer the condition becomes more miserable as the river basin agriculture contributes to the decaying of organic pollutants.

Key Words: Pollution, BOD, human activities, river basin agriculture.

INTRODUCTION

Of all the planet's renewable sources, water has a unique place. It is essential for sustaining all forms of life, food production and economic development and for general well being. Due to tremendous increase of human population and the domestic activities of the peoples related to water, the aquatic ecosystem perceptibly altered in several aspects in recent years. Water is regarded as a polluted when it is changed in its quality or compositions directly or indirectly as a result of human activities, so that it becomes less suitable for drinking as well as domestic and other purposes. Many of the rivers and lakes are becoming increasingly murky, smelly and choked with growth of algae. Most of the rivers have become darkened with sewage, effluents, agricultural runoff etc. Natural waters are no longer capable of composing these impurities (Bobde *et al*. 2009 Abidin *et al. 2009*)

Natural water has a self purification capacity, as the polluted river water get cleaned along the stretch by settling down the solids and biodegradation of organic wastes. But it has its own limit, (Pande and Sharma, 1998). Nature itself is a great cleansing agent but as for as capacity of assimilation of pollutants is concern, river water has limitations. The conservation and efficient utilization of available water resources need maximum emphasis. Some of recent relevant studies on physic-chemical parameters have been made by Khajuria and Dutta,(2009), Sawane et al., (2009), Fotedar and Fotedar (2009) and Yadav et al., (2009).

MATERIAL AND METHODS

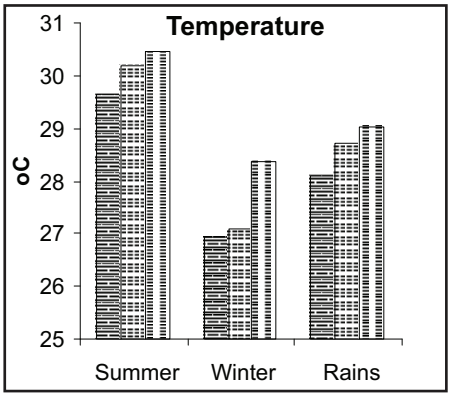
A work plan was conceived for the present investigation, to study the water quality of Wainganga river in the vicinity of Pauni town. Pauni town is located within Bhandara district, 87 Kms south east from Nagpur (Maharshtra), in central India, on the bank of Wainganga river. To assess the quality of river water and impact of human activities on the water quality and also to gain the information about the extent of pollution the proposed work is aimed at devising ecologically sound new strategies for conservation of river through prevention of pollution emphasizing appraisal of environmental status of river, by studying physicochemical parameters and to determine causes of pollution.

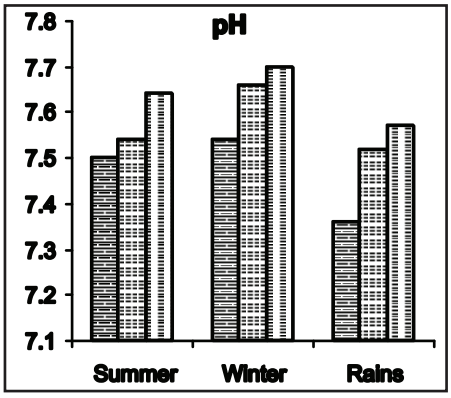
The collection of water sample from different stations

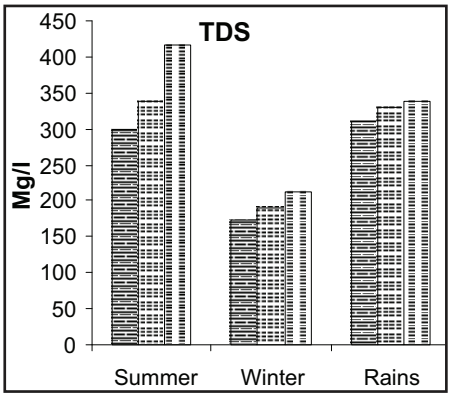
and depths of river was done by Mayer's sampler every week. Three sampling stations were selected in the vicinity of municipal water pumping station to collect the water samples, namely upstream station 'A', municipal water pumping station is station 'B' and down stream to pumping station 'C'. The analysis for temperature, pH, conductivity and dissolved oxygen were performed in the field by using "Portable Water Analysis Kit" manufactured by 'Electronix India, Ajmer', having COMS – LSI technology, with accuracy of ± 2.0 %. The resulstsf were confirmed by the experimental methods time to time, (NEERI, 1986).

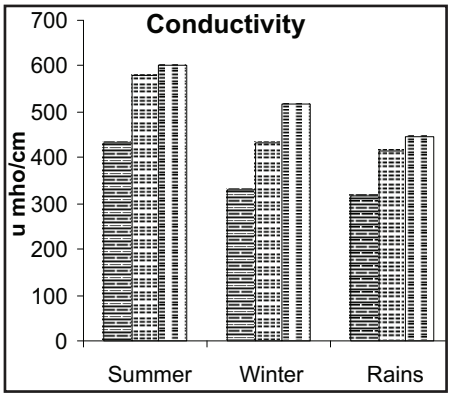
Table – 1.1
Variation of different parameters in Wainganga river water, at municipal water pumping station.

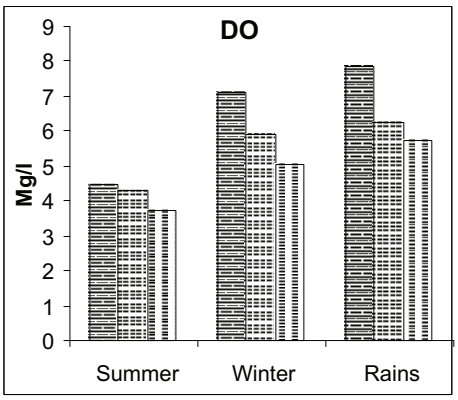
SEASON	STATION	TEMP. °C	pH	TDS. (mg/l)	COND. (µmho/cm)	DO. (mg/l)	BOD. (mg/l)
Summer	A	29.66 ± 0.24	7.5 ± 0.05	299 ± 19	430.44 ± 22.24	4.45 ± 0.23	13.86 ± 0.45
	B	30.19 ± 0.48	7.54 ± 0.20	337 ± 11	580.43 ± 17.98	4.3 ± 0.49	40.05 ± 3.47
	C	30.47 ± 0.77	7.64 ± 0.23	417 ± 10	602.77 ± 10.79	3.73 ± 0.59	44.01 ± 2.01
Winter	A	26.93 ± 0.23	7.54 ± 0.12	174 ± 11	330.21 ± 12.37	7.13 ± 0.25	6.3 ± 0.66
	B	27.09 ± 0.35	7.66 ± 0.11	191 ± 6	433.45 ± 12.68	5.93 ± 0.57	25.89 ± 1.47
	C	28.37 ± 0.57	7.7 ± 0.16	213 ± 13	514.98 ± 11.95	5.03 ± 0.34	29.58 ± 2.88
Rains	A	28.09 ± 0.18	7.36 ± 0.12	211 ± 12	315.27 ± 13.68	7.83 ± 0.23	25.97 ± 0.49
	B	28.7 ± 0.19	7.52 ± 0.10	329 ± 16	416.78 ± 16.64	6.27 ± 0.3	28.33 ± 2.45
	C	29.04 ± 0.20	7.57 ± 0.11	337 ± 10	447.07 ± 11.14	5.73 ± 0.55	31.52 ± 3.47











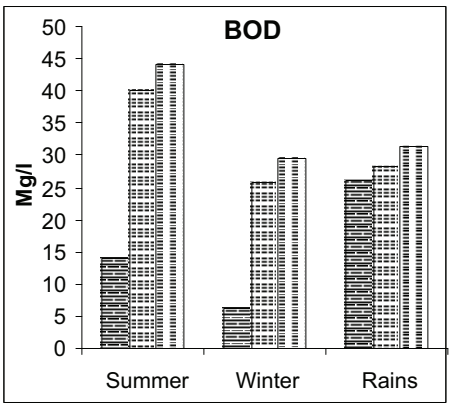


Figure - Seasonal variations of parameters in Wainganga river at water pumping station

RESULTS AND DISCUSSION

Perusal of data harvested during the study period indicates that the temperature of river water at sampling stations varies according to the extent of organic pollution and the flow of river. The organic pollution load at station 'B' and 'C' by human domestic activities and agricultural farming in the river basin, increase the temperature of water, (Musaddiq, 2000). Increasing bio-decomposition reactions involves the production of heat, which may be responsible to increase the temperature at sampling stations 'B' and 'C'. There is no significant source of pollution at station 'A', hence recorded comparatively lower values of temperature, (Mishra and Jha, 1996). Use of cow dung manure in the crop fields of watermelon and muskmelon, present in the open sand at middle part of river basin resulted in to increase of phytoplankton population and eutrophication.

Hence, the continuous addition of organic matter by manuring the crop fields, cattle washing and daily washing of utensil and clothing's by the locality residing on the bank of river, contributes to enhance the microbial activities in the river water at station 'C'. That intern increase the depletion of dissolved oxygen from the water and increase the biochemical oxygen demand of water. These findings are similar to Komal *et al.*, (2007) in Ganga river at Haridwar. While at water pumping station 'C', the bathing, cattle activities and entry of organic manure in the water lowers the values of dissolved oxygen. During the months of February and March, intense sunlight enhances the rate of photosynthesis of aquatic vegetation and increased temperature of water in summer days enhance the rate of microbial degradation of organic matter in river water, which resulted in to depletion of dissolved oxygen from water. Similar studies have been made by Sawane et al., (2004, 2009) and Shukla et al., (2009)

During post summer days the less flow of river offers more concentration of pollutants to the water may attribute to increase of carbonates and bicarbonates. On the other hand turbid water due to load of pollutants, lowers the rate of phytoplanktonic activities and their assimilation of carbon dioxide and bicarbonates also, which may be responsible to increase the hydrogen ion concentration of water and alkalinity. During winter days, clear water and abundance of aquatic flora and their moderate rate of photosynthetic activities enhance the assimilation of bicarbonates from water, may attributed to comparatively lower values of hydrogen ion concentration in river water. At station 'A' the deposited soil sediments maintains the pH of water, as there is no significant source of pollution at this station, (Bobdey *et al*, 2007). During rainy season surface runoff having eroded soil and organic matter from catchment areas maintains the increased pH of water. These finding corroborate with Sawane *et al*., (2006, 2009) and Makode and Charjan (2009).

Total dissolved solid contents increased during the summer months, which may be due to less flow of river offer the high concentration pollutants to the river water, (Jameel, 1998, Sawane *et al*., 2009 and Shukla *et al*., 2009,). Comparatively more water during the winter months, dilute the pollutants and recorded lower values of TDS. Eroded soil and surface runoff from catchments transfers enormous amount of dissolved solids in the river with rain water, hence the peak values of TDS were recorded during the rainy season.

Peak values of conductivity at polluted stations in summer may be attributed to inflow of organic matter by human activities enhance the ionic status of river water. At station 'A' the degradation of bottom sediments maintains the values of conductivity. During the winter months growth of aquatic flora and their assimilation and dilution of pollutants in moderate flow of river water resulted in to lower the conductivity of water at all sampling stations, (Hannan *et al*, 1979). Similar finding

were reported by Rajkumar *et al*., (2008) at Chittar-Uppodal river, Tirunelveli District, Tamilnadu.

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