



Water Quality and Pollution Status of Wardha River (Kaundyanapur) from Amravati District, (M.S.) India.

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Abstract:

Ironically, Wardha river passing by Kaundyanapur of Amravati district is viewed as a figure of purification by Hindus in this area and people persist in dumping the ashes of cremated bodies into it likewise the rivers Ganges and Godavari for spiritual rebirth. The physicochemical parameters which were analysed are Total hardness (TH), Total dissolved solids, Total alkalinity, Phosphate, Dissolved oxygen, BOD, COD. The values obtained were compared with BIS standards. Microbiological analysis was carried out to detect total coliforms (MPN/100ml) in river water. This analysis revealed that physicochemical parameters viz, Total hardness (TH), Total alkalinity, COD were beyond acceptable limits as recommended by BIS. Microbiological analysis showed that river water failed to satisfy prescribed limit of BIS. Therefore, present study revealed that Wardha River water passing by Kaundyanapur of Amravati district failed to qualify prescribed standards of BIS in physicochemical and microbiological aspects.

Keywords: Microbiological studies, Wardhariver.

Introduction:

Rivers play an important role in the development of nation and sustenance of life which are being polluted due to speedy urbanization, industrialization and other developmental activities (Alam and Pathak 2010). Supply of potable water is important to the development of any country. The quality of water is described according to their physicochemical and microbiological analysis. For effective maintenance of water quality through appropriate control measures, continuous monitoring of large number of quality parameters is essential (Mishra et al.2008).

Ironically, Wardha river passing by Kaundyanapur of Amravati district is viewed as a figure of purification by Hindus in this area and people persist in dumping the ashes of cremated bodies into it likewise the river Ganges and Godavari for spiritual rebirth. Kaundyanapur (Tiwsa Taluka) is a small town of Amravati district from Maharashtra which is famous historical place for Rukminidevi Mandir built along the bank of Wardha River and this river is under constant threat of pollution by discharges of ashes of dead bodies, floral wastes generated on account of pilgrimage during fair and agricultural runoff, cattle grazing, fecal contamination, washing of cloths and vehicles.





The present paper discusses account on physicochemical and microbiological studies of water pollution in Ward harrier passing by Kaundyannapur of Amravati district from Maharashtra studied for one year during Oct.2010 to Sept.2011. The analyzed data were compared with standard values recommended by BIS (1998).

Study area and Geographical location:-

The Wardha River is one of the biggest rivers in Vidarbha region in India. Wardha River originates at an altitude of 777 meters Satpura Range near Multai in Betul District of Madhya Pradesh. From the origin it flows 32 km in Madhya pradesh and then enters into Maharashtra. After traversing 528 km, it joins Wainganga together called Pranhita, which ultimately flows into the Godavari River.

Material and methods:

All the representative water samples were collected in clean, phosphate free polyethylene bottles that have been pre washed with dilute acid followed by distilled water using standard procedures (NEERI Manual 1988) during Oct.2010 to Sept.2011.

Various physicochemical parameters viz, Total hardness, Total dissolved solids, Total Alkalinity, Orthophosphate, Dissolved oxygen, BOD, COD were determined using standard procedures (APHA (1995), ICMR Manual (1977), Trivedy and Goel (1986). Water samples were also subjected to microbiological analysis using std. procedures (APHA 1995).

Alkalinity was determined by titrating a known volume of water sample with 0.02 M HCl. Dissolved oxygen (DO) was determined by Winkler's titration. Total dissolved solids (TDS) was determined gravimetrically by evaporating known volume of water to dryness in a pre-weighed crucible on a steam bath. Total hardness was determined by titrating with EDTA using Eriochrome black T as indicator. Biological oxygen Demand (BOD) was determined by using the relationship $BOD = DO - DO_5$ (APHA 1995). COD was determined by closed reflux titrimetric method.

Also, Microbiological analysis was carried out to detect total coliforms (MPN/100 ml).





Sampling locations for present study were as follows:-

Sample code	Site	Location
S ₁	Site I	Below bridge (Disposal of ashes of dead/cremated bodies)
S ₂	Site II	Near Stair case (Bathing activities by humans)
S ₃	Site III	Centre of River (Disposal of Hairs by humans)
S ₄	Site IV	Near Stair case of RukiminideviMandir (Disposal of floral wastes from RukminideviMandir)
S ₅	Site IV	West side of River (Cattle grazing)
S ₆	Site VI	Near bank of River (Fecal contamination)
S ₇	Site VII	South side of River (Agricultural runoff)
S ₈	Site VIII	Near Entry point of River (Washing of cloths)

Results and discussion:

The observations on physicochemical parameters and microbiological analysis of water samples from Wardha river passing by Kaundyannapur of Amravati district studied for one year during Oct.2010-Sept.2011 are presented in Table 1,2, and 3.

The total hardness of river water ranged from 216-222 mg/L during winter and summer and 213-218 mg/L during monsoon indicating that total hardness was beyond the acceptable limit throughout all the seasons. Hard water causes incrustation in distribution systems and excessive soap consumption (Coleman 1976). Total dissolved solids (TDS) of river water samples were in the range of 401-406 mg/L during winter, 403-409 mg/L during summer and 401-408 mg/L during monsoon. The desirable and maximum excessive level of TDS in drinking water prescribed by BIS is 500 mg/L and 1000 mg/L respectively. It appears that river water samples tested were not exceeding the desirable limit prescribed by BIS (Subin and Aneesha 2011).

According to Nayak *et al.*, (1982) and Ghosh and George (1989) the higher alkalinity indicates pollution. Total alkalinity of water is caused mainly due to OH, CO₃, HCO₃ ions. Alkalinity is an estimate of the ability of water to resist change in pH upon addition of acid (Mahananda *et al.* 2010).The total alkalinity varied from 356-361 mg/L during winter, 355-361 mg/L during summer and 354-359 mg/L during monsoon. Total alkalinity was beyond the acceptable limit throughout all the seasons. Phosphate is considered amongst the primary limiting nutrients in ponds and lakes (Schindler 1971). The concentration of phosphate varied from 0.044-0.074 mg/L during winter, 0.041-0.071 mg/L during summer and 0.042-0.068 mg/L during monsoon.





High level of DO is normally a sign of healthy river and it is highly fluctuating in the range of 6.7-7.2 mg/L during winter and summer and 6.7-7.4 mg/L during monsoon. Decrease in DO can favor anaerobic decomposition of organic wastes (Sallae 1974). The BOD value ranged from 2.6-3.2 mg/L during winter, 2.8-3.3 mg/L during summer and 2.7-3.3 mg/L during monsoon. As per BIS, the maximum permissible limit is 5 mg/L and it is within the permissible limit throughout all the seasons as per BIS standards.

COD estimates the carbonaceous fraction of organic matter (Arthiet al. 2011). COD value ranged from 8.8-9.2 mg/L during winter, 8.9-9.2 mg/L during summer and 8.8-9.3 mg/L during monsoon. High value of COD was recorded during all the seasons which clearly indicate pollution.

MPN of coliforms/100 ml was recorded in the range of 140- 1600/100 ml during winter, 70- 540/100 ml during summer and 170≥1600/100 ml during monsoon. The values of MPN of coliforms/100 ml have exceeded the prescribed limits during all the seasons

The study revealed that various physicochemical parameters viz Total alkalinity, Total hardness and COD were beyond acceptable limits as recommended by BIS indicating that Wardha River water is polluted. This pollution is due to the disposal of ashes in river, floral wastes, domestic sewage, agricultural runoff, fecal contamination, cattle grazing, washing of cloths. MPN of coliforms/100 ml also exceeded prescribed limits as per BIS standards (1998). Therefore, people in these areas have high potential risk of contracting water borne diseases if they use this river water for drinking purposes (Musaddiq 2000; Fokmare and Musaddiq 2001).

It may be concluded that Wardha River water passing by kaundyannapur of Amravati district failed to qualify prescribed limits recommended by BIS in physicochemical as well as microbiological aspects. Therefore, it is recommended that river water should not be used for domestic purposes without treatment.

Table. 1- Physicochemical parameters and bacteriological analysis of Wardha River (Kaundyannapur) during Winter (Oct.2010-Jan.2011).

Parameters	BIS Limit	S1	S2	S3	S4	S5	S6	S7	S8	Mean
TH		221	219	220	218	217	216	219	222	219
TDS		406	403	405	402	404	403	401	402	403.2
Total alkalinity		359	357	358	360	356	361	358	359	358.5
Phosphate(PO ₄)		0.074	0.069	0.071	0.064	0.059	0.053	0.049	0.044	0.06
DO		6.8	6.7	6.9	7.1	7.2	6.8	6.7	7.0	6.9
BOD		3.2	3.1	2.9	3.1	2.8	2.7	2.9	2.6	2.9
COD		9.2	8.9	9.1	8.8	8.9	9.0	8.9	8.8	8.9
MPN/ 100 ml	10/100	920	540	350	140	220	1600	280	316	278

Note:-All parameters are expressed in mg/ml



Table. 2- Physicochemical parameters and bacteriological analysis of Wardha River (Kaundyannapur) during Summer (Feb.2011- May 2011).

Parameters	BIS Limit	S1	S2	S3	S4	S5	S6	S7	S8	Mean
TH	200-600	222	219	221	218	220	217	219	216	219
TDS	500-2000	409	407	408	406	405	407	404	403	406.1
Total alkalinity	200-600	361	359	358	357	358	356	355	356	357.5
Phosphate(PO ₄)	--	0.067	0.071	0.061	0.057	0.051	0.054	0.049	0.041	0.055
DO	--	6.9	6.7	6.8	7.1	7.2	7.0	6.8	6.7	6.9
BOD	5	3.3	3.1	3.2	2.8	2.9	3.0	2.9	2.8	3.0
COD	--	9.1	8.9	9.2	9.0	8.9	9.1	9.2	9.0	9.05
MPN/100 ml	10/100ml	540	350	220	240	110	620	70	94	318

Note:-All parameters are expressed in mg/ml

Table. 3- Physicochemical parameters and bacteriological analysis of Wardha River (Kaundyannapur) during Monsoon (June 2011- Sept.2011).

Parameters	BIS Limit	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	Mean
TH	200-600	216	214	217	216	215	213	218	214	215.3
TDS	500-2000	404	402	403	405	407	406	401	408	404.5
Total alkalinity	200-600	356	355	357	354	356	358	355	359	356.2
Phosphate(PO ₄)	--	0.068	0.061	0.064	0.058	0.051	0.053	0.048	0.042	0.056
DO	--	6.7	6.9	6.8	7.0	7.2	S ₆	S ₇	S ₈	Mean
BOD	5	3.1	3.2	3.3	3.0	2.8	213	218	214	215.3
COD	--	8.9	9.1	9.0	8.8	9.1	406	401	408	404.5
Parameters	10/100ml	1600	220	280	350	170	358	355	359	356.2

Note:-All parameters are expressed in mg/ml

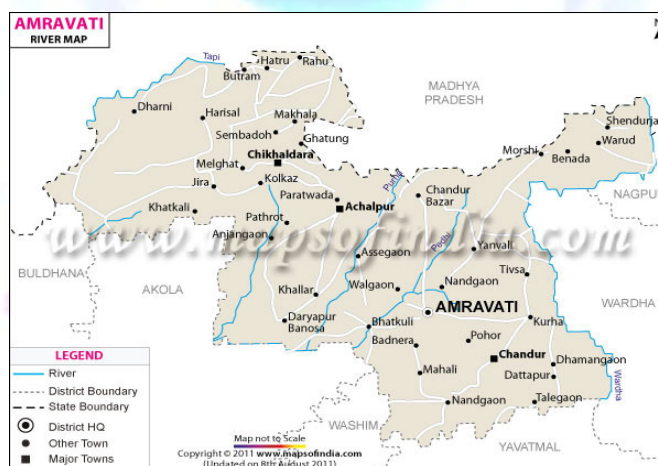


Figure. 1- Amravati District River

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