

## Preliminary studies on physico-chemical parameters of river Wardha, District Chandrapur, Maharashtra

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**ABSTRACT:**

The total environment is a complex entity of which water is the essential component for survival of all the living beings. Life in aquatic environment is largely governed by physico-chemical characteristics and their stability in ecosystem. The precipitation which is the main source of water gets contaminated as soon as it reaches on the earth's surface and during its flow anthropogenic activities in surrounding area further add impurities in it. The water samples were collected monthly for a period of one year from different sampling stations along the stretch of river. During study period, river maintained well alkaline nature of water in study area. Parameters like dissolved oxygen, conductivity, total hardness, total alkalinity and pH showed variation from upstream to downstream. Dissolved oxygen was found to be maximum during winter may be due to low temperature. However, conductivity, total hardness and total alkalinity were found to be maximum during the summer season.

**Keywords:**

*Wardha River, pH, Conductivity, Alkalinity.*

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**INTRODUCTION**

Water and life have an inseparable relationship and are considered as two sides of a single coin. As such, water quality plays an important role in the growth of aquatic animals and their distribution and abundance. Fluctuations in optimum level of water quality may lead to abrupt changes in the aquatic life.

The lotic ecosystem selected for the present study is the Wardha river, which is the only Perennial River of the area. The present piece of work was carried out for one year i.e. from October - 2009 to September - 2010. The parameters like Water Temperature, pH, Conductivity, Total Hardness, Total Alkalinity, Dissolved Oxygen etc. were analyzed.

Many reports are available in India (Arora *et al.*, 1973; Chandra and Mathur, 1983; Fulekar and Dave, 1989; Raghunathan *et al.*, 2000; Sawane, 2002; Dahegaonkar, 2008) on the water quality assessment of lotic ecosystems. Except Saraf and Shenoy (1986), no report is available on this lotic ecosystem in the area, hence the present investigation.

**MATERIALS AND METHODS**

To analyze physico-chemical parameters, water samples were collected every month for the period of one year. Water samples were collected from the marginal areas at 1 to 1.5 m depth in dried plastic cans of five liter capacity during morning hours. Three sampling sites were selected (SW1, SW2 and SW3) along the stretch of river at a distance of 1 to 1.5 Kms. from upstream to downstream. The parameters like water Temperature, pH

and D.O. were analyzed at the sampling sites while remaining were analyzed in the laboratory using pertinent literature, APHA (2005).

**RESULTS AND DISCUSSION**

Physico-chemical characteristics are very important since they have a profound effect on the diversity of living organisms dwelling in them. The seasonal variations in physico-chemical parameters are represented in **Tables 1, 2 and 3.**

**Water Temperature**

Water Temperature is an important factor in aquatic medium which determines the quality of water. In the present investigation, maximum Water Temperature was recorded during summer and minimum during winter season. Similar observations were also recorded by Sawane (2002) and Khinchi *et al.*, (2011).

**pH**

According to George (1997) pH is an important parameter of water, since most of the aquatic organisms are adapted to average pH and do not withstand abrupt changes. During study period, river maintained well alkaline nature in the study area. Maximum pH was recorded during summer and minimum during monsoon season. Narain and Chauhan (2000) recorded maximum pH in summer and minimum in monsoon, similar observations were also reported by Bandela *et al.*, (1998) and Khalique (1995).

**Conductivity**

In the context of an aquatic media Conductivity totally depends upon the concentration of ions in the

**Table 1: Seasonal values of physico-chemical parameters in River Wardha during 2009-10 at site SW1**

Parameters	Winter	Summer	Monsoon	Total
Water Temperature	23.13 ± 0.54	30.00 ± 2.62	29.00 ± 2.03	27.38 ± 1.73
pH	8.19 ± 0.07	8.28 ± 0.08	7.98 ± 0.05	8.15 ± 0.07
Conductivity	0.374 ± 0.026	0.581 ± 0.094	0.502 ± 0.064	0.486 ± 0.061
Total Hardness	52.75 ± 3.03	61.00 ± 9.41	41.25 ± 5.31	51.67 ± 5.92
Total Alkalinity	78.75 ± 7.40	88.00 ± 14.82	66.38 ± 12.77	77.71 ± 11.66
Dissolved O <sub>2</sub>	8.23 ± 0.41	6.53 ± 1.28	6.85 ± 1.25	7.20 ± 0.98
Nitrate	0.857 ± 0.035	0.800 ± 0.063	1.010 ± 0.129	0.889 ± 0.076
Phosphate	0.750 ± 0.057	0.915 ± 0.064	0.788 ± 0.025	0.818 ± 0.049

**Table 2: Seasonal values of physico-chemical parameters in River Wardha during 2009-10 at site SW2**

Parameters	Winter	Summer	Monsoon	Total
Water Temperature	24.00 ± 0.71	31.13 ± 3.15	29.75 ± 1.82	28.29 ± 1.89
pH	7.93 ± 0.06	8.33 ± 0.08	7.97 ± 0.04	8.08 ± 0.06
Conductivity	0.283 ± 0.009	0.403 ± 0.039	0.373 ± 0.026	0.353 ± 0.025
Total Hardness	59.50 ± 1.80	65.75 ± 7.63	45.00 ± 7.71	56.75 ± 5.71
Total Alkalinity	98.75 ± 4.15	111.25 ± 16.72	96.25 ± 5.45	102.08 ± 8.77
Dissolved O <sub>2</sub>	7.19 ± 0.19	4.80 ± 0.33	6.16 ± 0.67	6.05 ± 0.39
Nitrate	0.739 ± 0.041	0.740 ± 0.037	0.965 ± 0.090	0.814 ± 0.056
Phosphate	0.732 ± 0.045	0.789 ± 0.028	0.906 ± 0.038	0.809 ± 0.037

water. In the present investigation, maximum Conductivity was recorded during summer and minimum during winter season. High concentration of municipal water due to anthropogenic activities and less flow during summer is responsible to increase the ionic content which results in the increased level of Conductivity. Similar results were reported by Israili and Ahemad (1993) in river Yamuna and Khatavkar and Trivedi (1992) in river Panchaganga.

#### Total Hardness

Total Hardness of water is the sum of the concentration of alkaline earth metal cations. In the present investigation, maximum Total Hardness was recorded during summer season at station SW2 may be due to low water level and addition of calcium and magnesium salts used for different anthropogenic activities in the vicinity. However, low values during rainy season attributed to dilution on account of heavy precipitation. Same was reported by Rajalakshmi and Shreelatha (2005) in river Gautami Godavari at Yanam.

#### Total Alkalinity

Alkalinity is the measure of buffering capacity of the water. It is generally imparted by the salts of carbonates, bicarbonates, phosphate, nitrates etc. (Yellavarthi, 2002)

In the present investigation, maximum value of Total Alkalinity was recorded during summer and minimum during monsoon season. Sankaran (1988) in Adyar River reported high values of alkalinity in summer and low during rainy season.

#### Dissolved Oxygen

Dissolved Oxygen is extensively used as a parameter determining the water quality and to evaluate the degree of freshness of lotic ecosystem.

In the present investigation, the maximum D.O. was recorded during winter, moderate during monsoon and low during summer. Present results correlate with the findings of Bansal (1989) Mohanta and Patra (2000), Khinchi *et al.*, (2011). Maximum values of D.O. in winter might be due to the fact that the solubility of D.O. increases with the decrease in Water Temperature (Arvind Kumar and Singh, 2002).

**Table 3: Seasonal values of physico-chemical parameters in River Wardha during 2009-10 at site SW3**

Parameters	Winter	Summer	Monsoon	Total
Water Temperature	23.13 ± 0.54	30.75 ± 2.84	29.63 ± 1.08	27.83 ± 1.49
pH	8.03 ± 0.07	8.29 ± 0.07	7.94 ± 0.07	8.08 ± 0.07
Conductivity	0.304 ± 0.017	0.389 ± 0.032	0.358 ± 0.024	0.350 ± 0.024
Total Hardness	58.25 ± 2.05	66.00 ± 7.81	48.75 ± 1.48	57.67 ± 3.78
Total Alkalinity	93.75 ± 11.92	102.50 ± 12.50	86.25 ± 5.45	94.17 ± 9.96
Dissolved O <sub>2</sub>	8.05 ± 0.11	6.68 ± 1.11	6.75 ± 0.34	7.16 ± 0.52
Nitrate	0.869 ± 0.034	0.758 ± 0.039	0.986 ± 0.096	0.871 ± 0.056
Phosphate	0.762 ± 0.054	0.799 ± 0.028	0.898 ± 0.050	0.819 ± 0.044

### Phosphate

Phosphate is considered as the most critical single element for biological productivity. Banerjee, (1967).

In the present investigation, maximum concentration of Phosphate was recorded in summer and minimum in winter season. Similarly, Ansari (1993) reported high values of Phosphate in summer in river Godavari at Nanded. Koshy and Nayar (2000) reported that the major sources of Phosphate in water are domestic sewage, agricultural runoff, industrial effluents and fertilizers.

### Nitrate

Nitrate is an excellent parameter to judge organic pollution and it represent the higher oxidized form of nitrogen. The present investigation redeems the maximum value of Nitrate during monsoon and minimum during summer season.

Arvind Kumar and Singh (2002) reported high value of Nitrate during rainy season and attributed it to influx of nitrogen rich flood water that brings large amount of contaminated sewage.

Most of the parameters were maximum in summer may be due to high temperature, high evaporation and low water level and minimum in winter due to increased water level.

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