SEASONAL VARIATION IN THE PHYSICOCHEMICAL PARAMETERS OF RIVER WAINGANGA NEAR BRAMHAPURI, DIST: CHANDRAPUR (MS).

A.W Chavan., A.A Dhamani, V.B. Murkute
Centre For Higher Learning and Research in Zoology,
Dept of Zoology, N.H.College, Bramhapuri, Dist: Chandrapur (M.S.), India
chavanaw@gmail.com

ABSTRACT

The present study was aim to analyze the physicochemical parameters of the river Wainganga and carried out from the month of June, 2005 to May, 2006. Every month samples were collected from four sampling sites (Site A to Site D) by analyzing the various physicochemical parameters such as Temperature, pH, TDS, Conductivity, DO, free CO_2, Sulphate, Phosphate, Nitrate, BOD, COD. The paper highlights the condition of this river water in various seasons with respect to the parameters mentioned above.

Key Words: Physicochemical parameters, Wainganga River, Bramhapuri.

Introduction

In India, the inland water bodies, whether lentic or lotic systems, suffer much due to environmental pollution. The ecosystems are the recipients of wastes of human society. Most of the rivers and their tributaries are being used as site for disposal of domestic wastes and therefore, existence of biotic community becomes doubtful. The natural hydrological cycle interacting with geochemical cycle and combination with anthropogenic activities determine the quality of inland water. Though the water is primarily use to satisfy the drinking needs of peoples near the river however, the recent population explosion, unplanned urbanization, industrialization, changes inland use pattern and life style of inhabitants in the vicinity of rivers exerted enormous pressure on this natural resources and thereby bringing about degradation to a greater extent.

The Wainganga River is a main tributary of Godavari riverine system. It is Perennial River at a distance of 10 Kms from Bramhapuri town which is situated at triangle of Chandrapur, Gadchiroli and Bhandara district of Vidarbha region. The entire area are lake studded, being traditionally paddy growing. It contributes important biotope for Ichthyofauna of this region. The water is mainly used for domestic, agricultural and industrial purposes. Baring few reports (Bobdey, 2002) no attempts were made to analyzed the physicochemical characteristics of Wainganga river of this region. Therefore, this paper attempted to observed seasonal variation in the physicochemical characteristics of this lotic ecosystem.

Material and Methods

Water samples were collected in polythene bottles, (two liters) once in a month, from the four selected sites of River Wainganga for analyzing the water quality parameters within a period of 12 months from June 2005 to May 2006. The analysis of temperature, pH and Dissolved oxygen was done on the field, and remaining parameters were analysed

in the laboratory. The samples were preserved by refrigeration at 4^0C, which is most generally accepted method. For analyzing the various parameters, methods given in APHA, (1975) were followed.

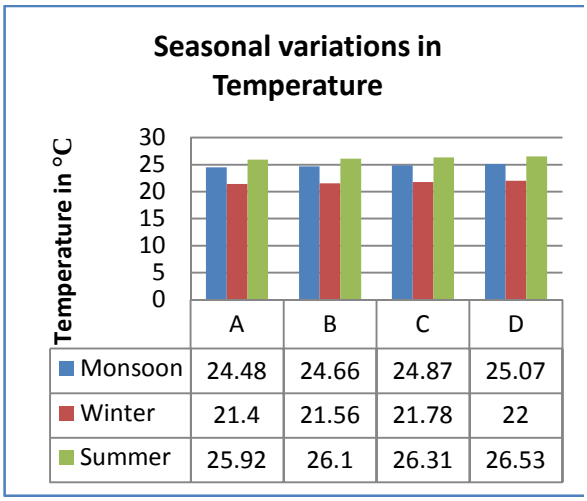
Results and Discussion

The physicochemical characteristic provides a fair idea of the water quality in any water body. The results of the seasonal variation in the physicochemical parameters of Wainganga River are summarized in table 1.

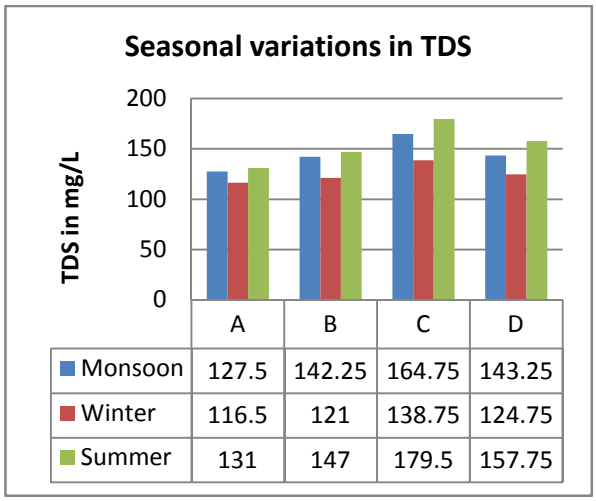
Table 1: Seasonal variations in Physicochemical parameters of Wainganga River (2005-2006).

Parameters	Season	Sampling Sites			
		Site A	Site B	Site C	Site D
Temp	M	24.48	24.66	24.87	25.01
	W	21.4	21.56	21.78	22
	S	25.92	26.1	26.31	26.53
Cond	M	69.88	78	105	100
	W	61.34	66.25	108.50	97.25
	S	71.94	80.50	110	105.75
TDS	M	127.5	142.25	164.75	143.25
	W	116.5	121	138.75	124.75
	S	131	147	179.5	157.75
pH	M	7.75	7.92	8.55	8.47
	W	7.33	7.75	7.71	7.68
	S	7.31	7.44	7.86	7.97
DO	M	6.14	5.53	5.19	5.33
	W	8.34	8.56	7.64	7.71
	S	6.22	5.83	6.22	6.67
CO_2	M	2.48	3.49	3.98	4.19
	W	4.98	4.44	5.89	6.61
	S	5.54	6.74	7.14	7.34
Sulphate	M	11.2	13.26	13.95	10.41
	W	5.34	7.16	7.76	6.57
	S	7.31	7.53	8.44	7.17
Phosphate	M	0.06	0.19	0.33	0.27
	W	0.035	0.10	0.26	0.22
	S	0.053	0.10	0.11	0.09
Nitrate	M	0.76	1.04	1.26	0.77
	W	0.41	0.43	0.63	0.52
	S	0.25	0.35	0.40	0.35
BOD	M	2.18	2.90	6.51	2.92
	W	1.38	1.61	5.49	2.25
	S	2.14	2.30	5.78	2.47
COD	M	4.40	5.12	5.55	5.34
	W	5.57	5.67	9.89	9.24
	S	3.63	3.79	4.98	4.50

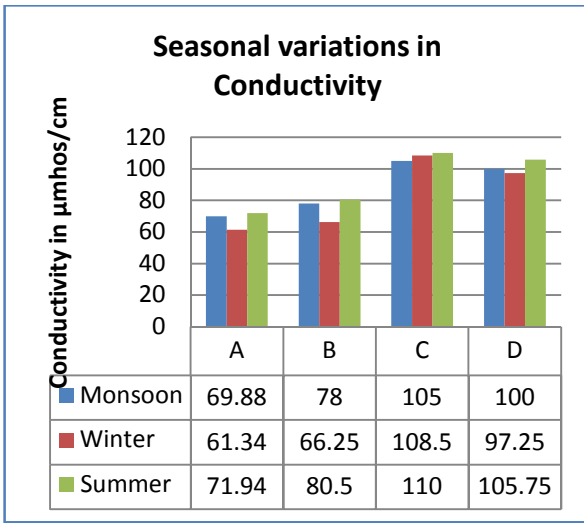
All Values are expressed in mg/L except Temperature, pH, Conductivity,
M: Monsoon; **W:** Winter; **S:** Summer



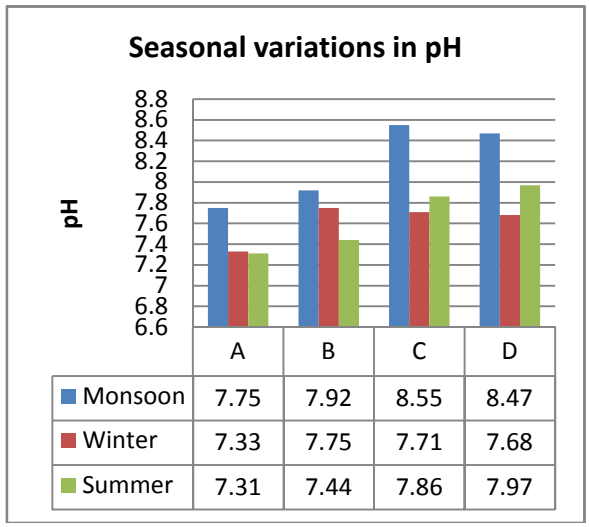
	A	B	C	D
Monsoon	24.48	24.66	24.87	25.07
Winter	21.4	21.56	21.78	22
Summer	25.92	26.1	26.31	26.53



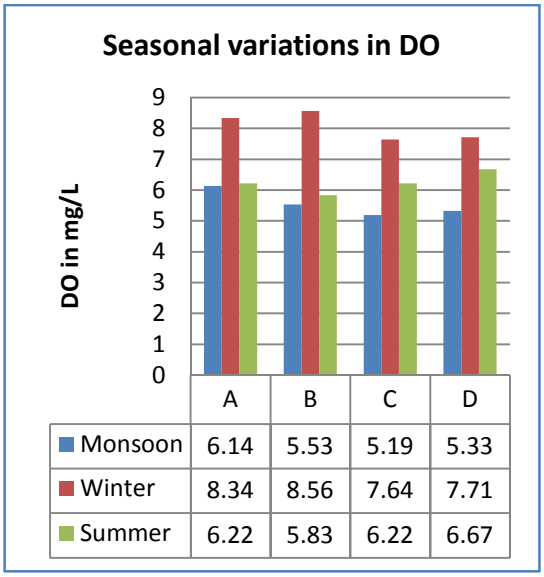
	A	B	C	D
Monsoon	127.5	142.25	164.75	143.25
Winter	116.5	121	138.75	124.75
Summer	131	147	179.5	157.75



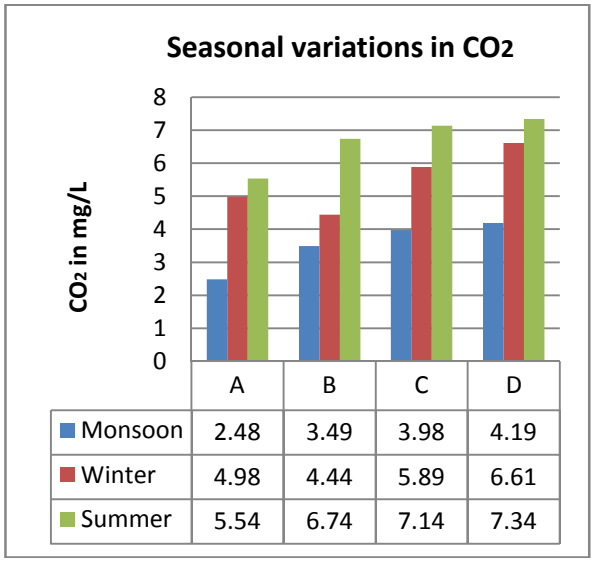
	A	B	C	D
Monsoon	69.88	78	105	100
Winter	61.34	66.25	108.5	97.25
Summer	71.94	80.5	110	105.75



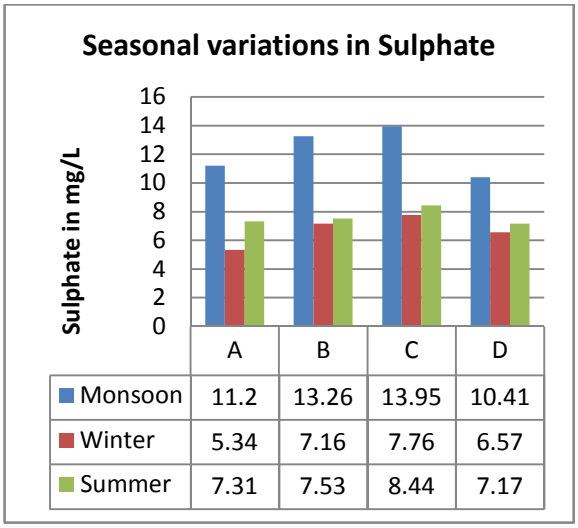
	A	B	C	D
Monsoon	7.75	7.92	8.55	8.47
Winter	7.33	7.75	7.71	7.68
Summer	7.31	7.44	7.86	7.97



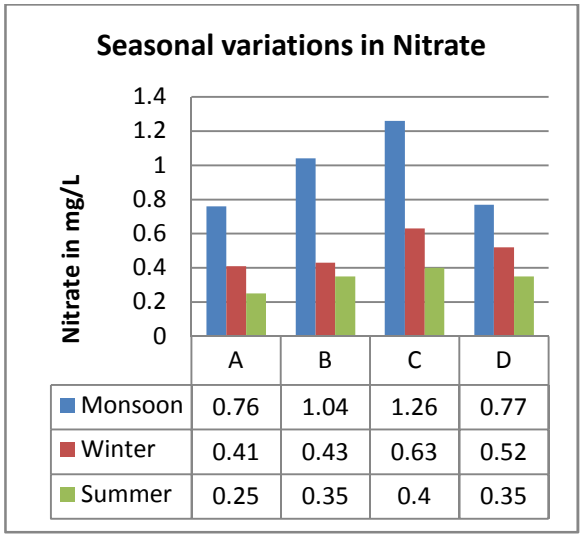
	A	B	C	D
Monsoon	6.14	5.53	5.19	5.33
Winter	8.34	8.56	7.64	7.71
Summer	6.22	5.83	6.22	6.67



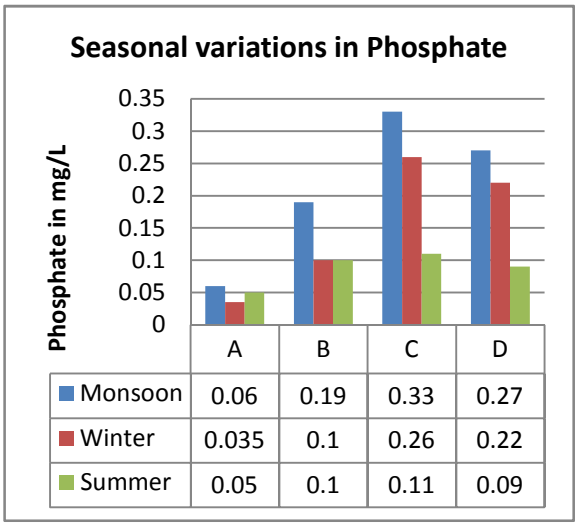
	A	B	C	D
Monsoon	2.48	3.49	3.98	4.19
Winter	4.98	4.44	5.89	6.61
Summer	5.54	6.74	7.14	7.34



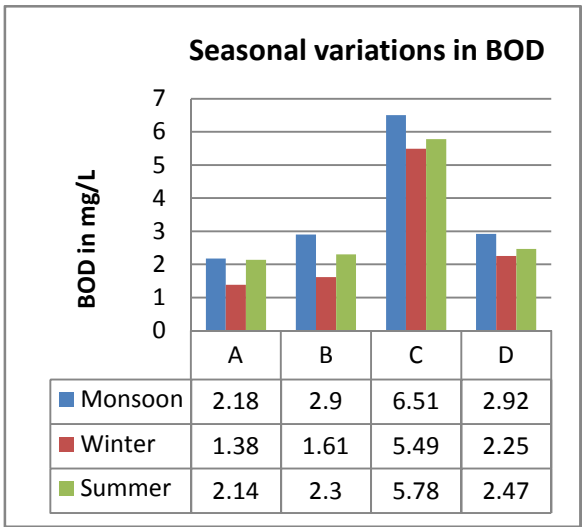
	A	B	C	D
Monsoon	11.2	13.26	13.95	10.41
Winter	5.34	7.16	7.76	6.57
Summer	7.31	7.53	8.44	7.17



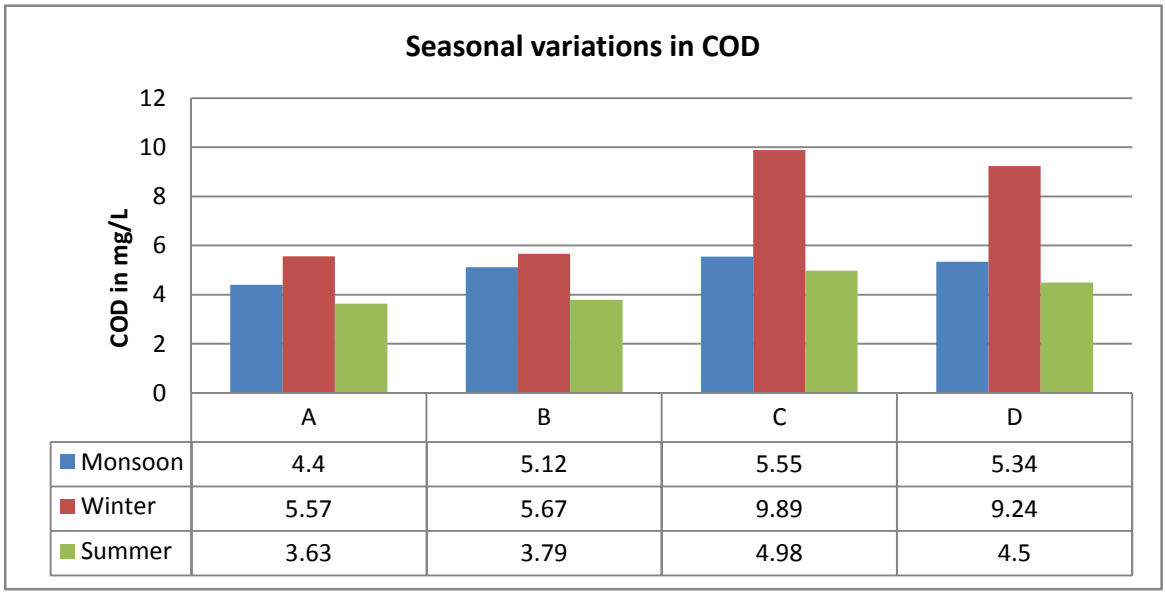
	A	B	C	D
Monsoon	0.76	1.04	1.26	0.77
Winter	0.41	0.43	0.63	0.52
Summer	0.25	0.35	0.4	0.35



	A	B	C	D
Monsoon	0.06	0.19	0.33	0.27
Winter	0.035	0.1	0.26	0.22
Summer	0.05	0.1	0.11	0.09



	A	B	C	D
Monsoon	2.18	2.9	6.51	2.92
Winter	1.38	1.61	5.49	2.25
Summer	2.14	2.3	5.78	2.47



	A	B	C	D
Monsoon	4.4	5.12	5.55	5.34
Winter	5.57	5.67	9.89	9.24
Summer	3.63	3.79	4.98	4.5

Temperature

It is considered as an important abiotic environmental factor, as a degree and annual variation in the temperature in a water body have a great bearing upon its productivity. In the present study, minimum temperature was 21.4 ^{0}C at site A during winter whereas maximum 26.53 ^{0}C at site D during summer. The low water temperature in the winter might be due to high water levels and lower solar radiation whereas maximum in the summer might be due to low water level, greater solar radiation and clear atmosphere. Similar results were reported by Arvind Kumar And Singh (2002) in the Mayurakshi River, Jharkhand and Sawane, et al., (2007) in the Irai River, Chandrapur.

Conductivity:

The conductivity is a numerical expression of the ability of a water sample to carry an electric current which inturn, depends on the total concentration of the ionized substances dissolved in the water and the temperature at which the measurement is made. The minimum conductivity value 61.34 µmhos/cm was recorded at site A during winter might be due to the less human interferences without any appreciable source of pollution thus, resulting in less ionic concentration and maximum of 110 µmhos/cm was recorded at site C during summer might be due to increased concentration of dissolved solids, usually due to less flow of water, increased evaporation and also input of paper mill effluents and sewage at this site. Similar results were reported by Bobdey (2002) in the river Wainganga, Pauni, Dist: Bhandara and Dahegaonkar (2008) in the three lotic ecosystems, Chandrapur.

Total Dissolved Solids (TDS):

Dissolved solids denotes the various types of minerals present in the water in dissolved forms, this may also includes organic substances in the dissolved forms as in the case of polluted water. Maximum value of TDS 179.50 mg/L was recorded at site C during summer might be due to receiving large quantity of domestic sewage and paper mill effluents whereas minimum 116.50 mg/L was recorded at site A during winter might be due to no any remarkable stress of pollutants thereby showing low TDS. Dahegaonkar (2008) reported high TDS during summer due to receiving of large quantity of domestic and industrial effluents whereas lower TDS during winter might be due to no sedimentation in the rivers Wardha, Erai and Zarpat at Chandrapur.

Hydrogen Ion Concentration (pH):

In the present study, the pH value from all the sampling sites were slightly alkaline throughout the study period which ranges from 7.31 to 8.55. Prakash et al., (2009) recorded the pH ranging from 6.90 to 8.80 in the river Cauveri. The maximum values of pH were recorded during monsoon at all the sites especially at site C and D, this may be due to the receipt of sewage from nearby villages containing more carbonates and bicarbonates and also effluents from nearby paper mill.

Dissolved Oxygen (DO):

Higher DO values were observed in the winter season and lower in the monsoon season at all the sites. Winter maxima might be due to the clear zone, fall in temperature, increased in the solubility of oxygen, slightly more photosynthetic activities and high aeration rate whereas monsoon minima might be due to the increased organic matter from surface and agricultural runoff. Arvind Kumar And Singh (2002) recorded high DO values in the winter might be due to solubility of dissolved oxygen increased with reduction in the water temperature.

Free Carbon-dioxide (Free CO_2):

Carbon dioxide is an end product of both aerobic and anaerobic bacterial oxidation; therefore, its concentration is not limited by the amount of dissolved oxygen. In the present study, maximum Free CO_2 7.34 mg/L was recorded during summer at site D whereas minimum value 2.48 mg/L in the monsoon at site A. Summer maxima might be due to higher rate of decomposition of organic matter by microorganism with consequent increase in free CO_2 and higher respiratory activities by benthos and microbes. Monsoon minima might be due to dilution effects as large quantity of water in the flooded river dilutes the decomposed organic matter to greater extent. This finding is in conformity with Bobdey (2002) in the Wainganga river at Pauni.

Sulphate:

In the present study, the concentration of sulphate was minimum 5.34 mg/L at site A during winter whereas maximum 13.95 mg/L at site C during monsoon. The maximum value at site C during monsoon might be due to domestic sewage from nearby villages, surface runoff and paper mill effluents whereas minimum value at site A during winter might be due to not having any appreciable load of organic input by domestic as well as other sources. Kulshreshtha, et al., (1992) reported maximum sulphate in the monsoon season which believed to be due to rain water bringing in high in put of sulphate from surrounding catchment area in Manasarovar reservoir, Bhopal, (MP).

Phosphate:

Maximum values 0.33 mg/L, 0.27 mg/L of Phosphate at site C and Site D during monsoon might be due to rain water bringing in high input of Phosphate from bank of river containing ashes of funeral pyres, nutrient soil deposited from catchment areas, agricultural runoff and paper mill effluents. Winter minima 0.035 mg/L at site A might be due to utilization of Phosphate by aquatic plants and assimilation of Phosphate by phytoplankton. Similar results were recorded by Chanu And Devi (2008) in the Iril river at Manipur.

Nitrate:

Though nitrogen is a major constituent of atmosphere, it is found in small amount in aquatic ecosystems due to low solubility but it also found in small amount in the form of ammonia, nitrates, nitrites, organic nitrogen and so on. In the present study, only nitrates were quantitatively estimated from the ecosystem understudy. Maximum value 1.24 mg/L of nitrate was recorded at site C during monsoon whereas minimum value 0.25 mg/L of nitrate at site A during summer. Monsoon maxima might be attributed to in flux of nitrogen rich flooded water that brings large amount of contaminated sewage water, runoff from agricultural fields, catchments areas and paper mill effluents. Summer minima might be attributed by phytoplankton and macrophytes as an evidence of high photosynthetic activities. Similar reports were given by Arvind Kumar And Singh (2002) in the Mayurakshi and Sarvankumar et al., (2008) in the arid mangrooes of Kachchh- Gujrat.

Biochemical Oxygen Demand (BOD):

Biochemical oxygen demand is an important parameter that indicates water pollution by oxidisable organic matter. The main sources of organic pollution are untreated domestic sewage, agricultural runoff and certain industrial effluents. In the present study, minimum value of BOD was observed 1.38 mg/L at site A during winter whereas maximum value 6.51 mg/L was observed at site C during monsoon. The maximum BOD at site C in the monsoon might be due to domestic sewage, surface runoff and paper mill effluents. At site A, there is no

receipt of any appreciable load of pollutants that gives low value at this site. Kataria et al., (1997) and Shivanikar et al., (1998) recorded maximum BOD in the monsoon and maximum in the summer in the Halali river, Bhopal and Godavari river, Nanded respectively.

Chemical Oxygen Demand (COD):

Chemical oxygen demand may be define as, the amount of oxygen required by the organic matter present in the water for its oxidation by strong chemical oxidant. The minimum value 3.63 mg/L of COD was observed at site A during summer whereas maximum value 9.89 mg/L of COD was observed at site C during winter. Winter maxima might be due to release of domestic sewage, paper mill effluents and other anthropogenic activities increase the chemical load. Summer minima might be due to evaporative loss of water, drying of river basin. Similar report was given by Chugh (2000) in the Godavari river, Hardwar.

On the basis of above parameters studied, Wainganga river in this stretch can be placed under Oligosaprobic in nature. Site B, Site C and Site D are appearing to be polluted than Site A which is mildly polluted. Though the river Wainganga is considered as Oligosaprobic, it may be mesosaprobic due to the human interference within forthcoming days. Therefore, proper care of this river should be taken by the local authority.

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