

Evaluation of Vashisti river water quality at Chiplun

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ABSTRACT

The present study was designed to demonstrate the variations in physical, chemical and biological characteristics of the water of Vashisti river at Chiplun district Ratnagiri of Maharashtra. The analysis of selected parameters was conducted for a period of two years i.e. January 2004 to December 2005. The water samples were collected once in a month, labeled properly and analyzed in the laboratory. Determination of physical parameter; (water temperatures), chemical parameters; (pH, TH, DO, COD, BOD, NH₃) and biological parameter; (MPN) were carried out to identify the nature and quality of the water of Vashisti river.

Keywords : Water quality parameters, River water, Potability.

INTRODUCTION

The Water quality deals with the physical, chemical and biological characteristics in relation to all other hydrological properties. Any characteristic of water that effects the survival, reproduction, growth and production of aquaculture species, influences management decisions, causes environmental impacts or reduces product quality and safety can be considered a water quality variable. Other factors being the same, aquaculture species will be healthier, production will be more, environmental impacts will be less and quality better in culture systems with good water quality than in those with poor water quality [5].

Water quality provides current information about the concentration of various solutes at a given place and time. Water quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions. For optimum development, management and beneficial uses, current information is needed which is provided by water quality programmes. Unequal distribution of water on the surface of the earth and fast declining availability of useable fresh water are the major concerns in terms of water quantity and quality [4].

The main pollution parameters that have to be considered for surface water quality management, in general, include water Temperature, pH, Dissolved oxygen, Dissolved and Suspended solids, Compounds of Phosphorus and Nitrogen, Biochemical oxygen demand and Chemical oxygen demand.

Study Area

Present study was undertaken from river Vashisti which is located at Chiplun of Ratnagiri, Maharashtra. This river is a major source as drinking water supply, also this water is used for several other purposes, includes agricultural, irrigation and industrial etc. The water sample collected from two sampling sites Upstream as (US) and Downstream as (DS).

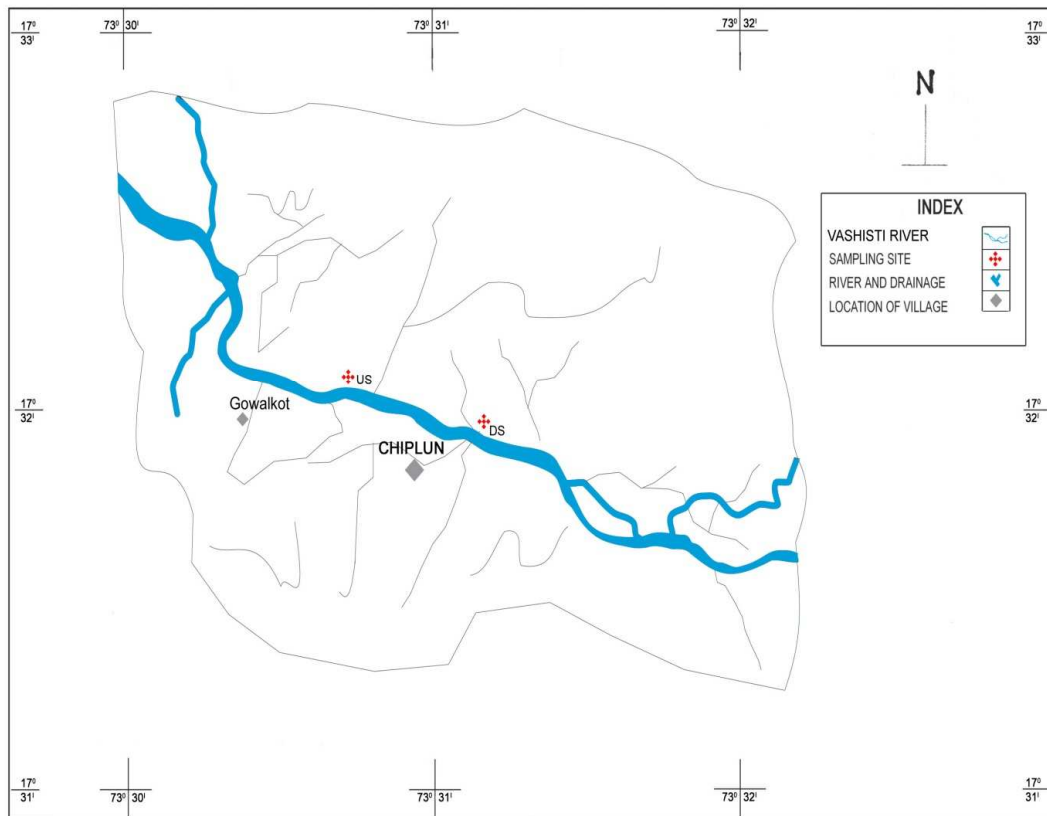


Figure 1: Geographical Location of the study area showing water sampling sites at Chiplun, district Ratnagiri

MATERIALS AND METHODS

Water samples from the selected two sites of Vashisti river were collected during January 2004 to December 2005. Water sample taken in a pre-cleaned polyethylene bottles

Water temperature measured by micro thermometer. The pH value of water sample under investigation was measured using digital pH meter. The pH was standardized by buffer of 4.0 pH and 9.2. The total hardness of the water sample were determined by complexometric titration with EDTA using Erichrome black T as an indicator. Dissolved Oxygen estimated by well known Winkler's method. COD of water measured by reflux method. BOD determined by 5 days incubation using same Winkler's method. Ammonia was estimated using UV-Visible spectrophotometers and MPN determined by using Mac Conkey broth.

All water quality parameters estimated by the standard methods given by APHA [1]

RESULTS AND DISCUSSION

Table 1: Monthly mean values of water quality parameters (mg/L) from Vashisti river during Jan 2004 – Dec 2004.

Months	Sample site	Temp. (°C)	p ^H	Total hardness	Dissolved oxygen	COD	BOD	Ammonia	MPN /100ml
Jan	US	26.5	7.415	94	5.55	8	2.5	0.1	4.5
	DS	27.25	7.425	102.5	5.25	14	4.0	0.2	21.5
Feb	US	27	7.475	90	5.9	6	2.5	0.15	6.0
	DS	28	7.3	97.5	5.35	14	3.5	0.2	24.0
Mar	US	28.25	7.675	92.5	6.85	10	3.0	0.15	8.0
	DS	28.75	7.25	98	5.5	18	4.0	0.3	34.0
Apr	US	28.75	7.41	75	5.5	10	2.5	0.25	5.5
	DS	29	7.28	91	5.2	16	3.5	0.4	26.0
May	US	28.25	7.485	67.5	5.8	8	2.0	0.25	5.0
	DS	29	7.185	83.5	5.35	12	3.0	0.4	22.0
Jun	US	29.25	7.555	77.5	5.85	10	2.5	0.3	5.5
	DS	29.5	7.125	81	5.3	14	3.5	0.35	26.5
Jul	US	28.25	7.45	72.5	5.9	6	2.0	0.2	9.0
	DS	29	7.135	83.5	5.2	12	3.0	0.3	24.0
Aug	US	26.25	7.55	80	6.1	4	2.0	0.3	11.0
	DS	27.55	7.35	86.5	5.1	10	3.0	0.35	24.5
Sept	US	25.5	7.39	87.5	5.95	8	2.5	0.4	12.0
	DS	26	7.285	93	5.1	12	3.0	0.45	29.0
Oct	US	24.25	7.585	92	5.9	12	2.5	0.2	11.5
	DS	25.5	7.225	98	5.05	18	4.0	0.35	30.5
Nov	US	24.5	7.605	98	5.8	8	2.0	0.25	7.0
	DS	26.1	7.265	102.5	4.85	14	3.0	0.4	24.5
Dec	US	24	7.6	95	5.9	10	2.5	0.2	7.0
	DS	25	6.2	98	5.15	16	3.5	0.3	29.0

US = Upstream, DS = Downstream

The variations in the concentration of water quality parameters are given in the tables 1 and 2.

The variation in temperature was from 24 °C to 29.25 °C at US and 25 °C to 29.5 °C at DS during the year 2004 while 23.75 °C to 28.85 °C at US and 24.5 °C to 29.25 °C at DS during year 2005.

The recorded water temperature which was ranged from 22.5-32.5°C from Kayadhu river, near Hingoli during January-December 2004 [7].

The variation in pH was from 7.41 to 7.675 at US and 6.2 to 7.425 at DS during the year 2004 while 7.37 to 7.625 at US and 7.1 to 7.35 at DS during the year 2005.

The observed high pH 7.66-7.86 and 7.58-7.66 which favoured the growth of algae during his study January 1994 to December 1995 from Panzara dam and river respectively [10].

Table 2: Monthly mean values of water quality parameters (mg/L) from Vashisti river during Jan 2005 – Dec 2005.

Months	Sample site	Temp. (°C)	p ^H	Total hardness	Dissolved oxygen	COD	BOD	Ammonia	MPN /100ml
Jan	US	27	7.45	92.5	5.55	8	2.5	0.15	4.5
	DS	27.5	7.26	100.5	5.7	14	4.0	0.25	21.5
Feb	US	26.75	7.53	89.5	5.8	6	2.5	0.15	6.0
	DS	28.25	7.225	98.5	5.65	14	3.5	0.2	24.0
Mar	US	28	7.425	95	6.8	10	3.0	0.25	8.0
	DS	28.5	7.125	98.5	6.3	18	4.0	0.3	34.0
Apr	US	28.5	7.41	85.5	5.65	10	2.5	0.25	5.5
	DS	28.75	7.2	93	4.75	16	3.5	0.3	26.0
May	US	28.25	7.5	74	5.85	8	2.0	0.25	5.0
	DS	28.75	7.275	82	5	12	3.0	0.3	22.0
Jun	US	28.85	7.525	75	5.75	10	2.5	0.25	5.5
	DS	29.25	7.1	82.5	5.35	14	3.5	0.25	26.5
Jul	US	28	7.4	73	5.9	6	2.0	0.2	9.0
	DS	29	7.125	81	5.1	12	3.0	0.35	24.0
Aug	US	26.75	7.45	76	6.15	4	2.0	0.25	11.0
	DS	28	7.35	78	5.35	10	3.0	0.35	24.5
Sept	US	26.25	7.37	83.5	5.95	8	2.5	0.35	12.0
	DS	26.5	7.155	91	5.15	12	3.0	0.35	29.0
Oct	US	24.75	7.525	86.5	5.8	12	2.5	0.25	11.5
	DS	24.5	7.225	95	5.2	18	4.0	0.35	30.5
Nov	US	25.85	7.61	90	5.7	8	2.0	0.25	7.0
	DS	25.5	7.25	96.5	4.85	14	3.0	0.35	24.5
Dec	US	23.75	7.625	91.5	5.8	10	2.5	0.25	7.0
	DS	25	7.35	94.5	5.1	16	3.5	0.3	29.0

US = Upstream, DS = Downstream

The total hardness obtained was from 67.5 mg/L to 98 mg/L at US and 81 mg/L to 102.5 mg/L at DS during the year 2004 while 73 mg/L to 95 mg/L at US and 78 mg/L to 100.5 mg/L at DS during the year 2005.

The researchers studied the seasonal variations of the Sular pond, Tamil Nadu. The total hardness values were found to be maximum 60.80 mg/L during summer 2002 and minimum 30.5 mg/L during January 2002 [6].

The variation in dissolved oxygen content was from 5.5 mg/L to 6.85 mg/L at US and 4.85 mg/L to 5.5 mg/L at DS during the year 2004 while 5.55 mg/L to 6.8 mg/L at US and 4.75 mg/L to 6.3 mg/L at DS during the year 2005.

The water of Anjanapura reservoir, Karnataka analyzed during November 2005 to October 2006. The dissolved oxygen level recorded in the range of 4.71 to 8.28 mg/L. The higher dissolved oxygen in winter season and rainy season at different four sampling stations [11].

The variation in COD content was from 4.0 mg/L to 12 mg/L at US and 10 mg/L to 18 mg/L at DS during the year 2004 while 4.0 mg/L to 18 mg/L at US and 10 mg/L to 18 mg/L at DS during the year 2005.

The water quality parameters of Noyyal river studied at Tirupur, Tamil Nadu. They found the COD values as 2.5, 90 and 620 mg/L source, Mangalam and Kasipalayam respectively, in the rainy season. They found COD amount as 3.0, 21, and 257 mg/L in same water sampling stations in summer season [8].

The water quality parameters of river Godavari studied at Nanded. They carried out the BOD analysis during year 1993 to 1994. They observed the values of BOD highest as 30 mg/L and lowest as 16 mg/L during entire work [2].

The variation in BOD content was from 2.0 mg/L to 3.0 mg/L at US and 3.0 mg/L to 4.0 mg/L at DS during the year 2004 while 2.0 mg/L to 3.0 mg/L at US and 3.0 mg/L to 4.0 mg/L at DS during the year 2005.

Influence of Adyar river in the coastal waters of Chennai having variations in BOD values in the low tide from 1.0 to 63.0 mg/L but variation was not appreciable during high tide. Increased BOD values are due to high organic load and biological activities resulting from sewage and industrial wastewaters etc [12].

The ammonia content ranged from 0.1 mg/L to 0.4 mg/L at US and 0.2 mg/L to 0.45 mg/L at DS during the year 2004 while 0.15 mg/L to 0.35 mg/L at US and 0.2 mg/L to 0.35 mg/L at DS during the year 2005.

The water quality of Tungabhadra river at Koodli studied during September 1997 to February 1998. He observed the ammonia-nitrogen as 0.19 mg/L, 0.50 mg/L, 0.31 mg/L and 0.43 mg/L at Tunga river, Bhadra river and confluence point of Tunga-Bhadra and after one kilometer from confluence point respectively [14].

The coliform/100 ml ranged from 4.5 /100 ml to 12 /100 ml at US and 21.5 /100 ml to 34 /100 ml at DS during the year 2004 while 4.5 /100 ml to 12 /100 ml at US and 21.5 /100 ml to 34 /100 ml at DS during the year 2005.

The work on river water at Nanded before treatment and after treatment of river Godavari was carried out with number of samples during year July 1999 to June 2000. They noted the values of Coliforms 900 and 200/100 ml. in river water and 25 and 0/100 ml in treated water (chlorinated) [3].

The water quality parameter status of Ganga river in the Bihar region was studied during March 2000 to February 2001. They observed maximum values of MPN/100 ml for total coliform and faecal coliforms in the rainy season that were 1.3×10^6 and 9.4×10^4 respectively. The rise in the

count may be due to the rapid growth of microbial population in the catchment area and open defecation along the riverbank. The minimum total coliform and faecal coliforms were 2.2×10^4 and 9.0×10^3 in the summer season respectively [13].

The bacteriological status of Yeoti lake of Mohol found during 2009 – 2010. From their results, it was found that the samples of Yeoti Lake contain higher coliform number. The MPN of all the water samples was 540/100ml throughout the study period. This reveals that the water may be contaminated with sewage [9].

Acknowledgement

We are acknowledging to the School of Earth Sciences of Swami Ramanand Teerth Marathwada University, Nanded for providing laboratory and library facilities.

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