



EVALUATION OF PHYSICO-CHEMICAL PARAMETERS OF RIVER KRISHNA AND RIVER VENNA, IN DISTRICT SATARA, MAHARASHTRA, INDIA.

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Abstract:

Satara district has a rich network of rivers and rivers provide us water for drinking and agricultural purposes. The present investigation deals with the physico-chemical parameters of Krishna and Venna rivers to investigate the quality of river water. The physico-chemical parameters of Krishna and Venna rivers such as pH, temperature, hardness, total dissolved solids, phosphate, nitrate, chloride, alkalinity, DO, CO₂ were observed and analyzed from August 2012 to July 2013 at every month. The physicochemical parameters of river Krishna such as pH, temperature, nitrate, hardness, chloride, TDS are within permissible limit of WHO and parameters such as alkalinity, phosphate, DO, CO₂ are exceeded the recommended limit of WHO. While all the physicochemical parameters except phosphate of river Venna are within the recommended limits of WHO.

Keywords: Physico-chemical, Krishna River, Venna River, Wai, Medha, Water Quality.

Introduction

Rivers provide us water, transportation and a means of disposal whereas it is natural ecosystem most intensely used by humans. The characters of rivers changes from its source to mouth. Two rivers or portions of two rivers are not identical in all aspects. Each section of a river is unique in several aspects and calls upon for an investigation (Goel and Autade,1995).

Satara district (Maharashtra-India) has a rich network of rivers. The main rivers of Satara district are Koyana and Krishna. The Krishna is one of the third largest sacred rivers of southern India. The Krishna river has its origin in Mahabaleshwar. Krishna water is mainly used for drinking and agricultural purpose while it is also used for industrial purposes. These industries include cement, acetox, fertilizers, iron, alcoholic product, vegetable oil, dye-chem. Industries and sugarcane industries which are also situated in the close vicinity of the Krishna river. The waste water from towns and industrial effluents from M.I.D.C's and sugarcane industries get entered in the Krishna river. Venna river is also originated in Mahabaleshwar, as a tributary of river Krishna. Krishna and Venna rivers run parallel to each other through Satara tahsil. Remarkable contributions are made in the field of limnology, hydrobiology and environmental quality of lotic aquatic environment by Iyengar (1939), Gonzalves and Joshi (1946), Chacko and Krishnamurthy (1954), Rao (1955), Das and Srivastava (1956), Ahmed (1966), Khan and Quayyam (1966).

Materials and Methods

The physicochemical parameters of river Krishna and river Venna was studied for one complete year, from August 2012 to July 2013. The water samples of river Krishna at sampling station Wai and the water samples of river Venna at sampling station Medha were collected in the Morning Hours between 9.00 a.m. to 12.00 noon throughout the study period. Two litre polythene (stoppered) cans were used for collection of water samples. The water samples were immediately brought into laboratory for the analysis of physico-chemical parameters. Some of the parameters such as pH and temperature were recorded at time of sample collection by using thermometer and standard pH meter, where as the other parameters such as Hardness , TDS, Phosphate, Nitrate, Chloride, Alkalinity, DO, CO₂ were estimated by using standard methods described by APHA (1985), Trivedy and Goel (1986), Kodarkar (2006).

Result and Discussion:

Monthly variations in physico-chemical parameters of river Krishna at sampling station Wai from August 2012 to July 2013 were recorded in Table No.1 and monthly variations in physico-chemical parameters of river Venna at sampling station Medha from August 2012 to July 2013 were recorded in Table No.2.

OBSERVATIONS

A) Observations on Physico-chemical parameters of the water in Krishna River.

Table No.1: Monthly variations in Physico-chemical parameters of the Krishna River at sampling station –Wai (Year 2012-13)

Physicochemical Parameters	Months												Mean and \pm S.D.
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	
pH	7.50	7.40	7.40	7.30	7.20	7.10	7.60	7.80	7.80	8.20	7.50	7.30	7.51\pm0.31
Temperature (°C)	23.00	23.80	23.60	22.70	21.20	18.20	23.20	26.80	29.50	31.60	28.30	27.40	24.94\pm3.82
Hardness (ppm)	245.0	240.0	220.0	215.0	185.0	132.0	189.0	220.0	240.0	239.0	270.0	253.0	220.67\pm37.33
Total Dissolved Solids (gm/lit)	0.34	0.33	0.33	0.28	0.25	0.20	0.32	0.36	0.37	0.39	0.33	0.41	0.33\pm0.06
Phosphate (ppm)	7.40	7.20	7.20	7.00	6.70	5.60	6.50	7.90	8.30	9.10	8.70	7.70	7.4 \pm0.98
Nitrate (ppm)	11.20	13.00	13.20	16.70	20.00	21.50	16.80	10.40	8.90	7.80	9.50	10.60	13.30\pm4.47
Chloride (ppm)	41.00	38.00	32.00	23.00	18.00	20.20	28.50	35.40	40.50	45.50	47.30	45.00	34.53\pm10.17
Alkalinity (ppm)	237.0	232.0	220.0	210.0	225.0	228.0	228.0	239.0	250.0	260.0	274.0	238.0	236.75\pm17.63
DO (ppm)	6.40	6.10	5.90	5.20	5.00	5.80	6.10	6.80	7.30	7.60	7.90	7.40	6.46\pm0.95
CO ₂ (ppm)	19.00	17.80	15.40	12.90	11.00	9.20	12.30	17.50	18.90	22.40	21.20	20.30	16.49\pm4.28

B) Observations on Physico-chemical parameters of the water in Venna River.

Table No.2. Monthly variations in Physico-chemical parameters of the Venna River at sampling station -Medha (Year 2012-13).

Physicochemical Parameters	Months												Mean and \pm S.D.
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	
pH	7.10	7.10	6.80	6.60	6.70	6.30	6.90	6.80	7.40	7.60	7.50	7.20	7.00 \pm0.39
Temperature (°C)	21.00	21.50	21.00	20.00	19.00	17.00	22.00	24.70	26.70	28.20	27.90	26.40	22.95\pm3.71
Hardness (ppm)	45.00	49.00	45.00	40.00	37.30	31.60	38.50	43.20	45.00	48.00	57.00	47.00	43.88\pm6.52
Total Dissolved Solids (gm/lit)	0.11	0.11	0.11	0.10	0.10	0.09	0.17	0.19	0.23	0.20	0.21	0.30	0.16\pm0.07
Phosphate (ppm)	6.00	5.40	5.00	5.20	3.30	3.00	4.80	5.50	6.70	7.10	7.00	6.50	5.46\pm1.33
Nitrate (ppm)	7.90	8.40	9.10	10.00	10.50	10.80	8.90	7.10	6.50	5.80	6.70	7.20	8.24\pm1.65
Chloride (ppm)	15.00	12.40	8.00	7.50	6.00	6.40	7.60	9.30	12.80	15.50	16.30	16.20	11.08\pm4.03
Alkalinity (ppm)	36.50	33.00	35.00	33.00	37.00	36.90	38.10	40.00	45.30	50.00	51.30	44.20	40.19\pm6.26
DO (ppm)	12.10	11.00	9.00	8.60	7.90	8.40	9.60	10.70	12.40	13.70	14.90	13.40	10.98\pm2.33
CO ₂ (ppm)	9.00	8.50	7.90	7.20	7.00	6.70	7.60	12.00	13.60	15.00	12.20	10.00	9.73\pm2.81

Table No.3. Comparative study of observed parameters in river Krishna and Venna with WHO

Sr.No.	Physico-chemical parameters	Observed Maximum Value		Observed Minimum Value		WHO limits
		Krishna River (Wai)	Venna River (Medha)	Krishna River (Wai)	Venna River (Medha)	
1	pH	8.20	7.60	7.10	6.30	6.5 - 9.2
2	Temperature (°C)	31.60	28.20	18.20	17.00	40 °C
3	Hardness (mg/l)	270.00	57.00	132.00	31.60	100-500 mg/l
4	Total Dissolved Solids (gm/lit)	0.41	0.30	0.20	0.09	500-1500 mg/l
5	Phosphate (mg/l)	9.10	7.10	5.60	3.00	0.1 mg/l
6	Nitrate (mg/l)	21.50	10.80	7.80	5.80	45 mg/l
7	Chloride (mg/l)	47.30	16.30	18.00	6.00	200-600 mg/l
8	Alkalinity (mg/l)	274.00	51.30	210.00	33.00	250 mg/l
9	DO (mg/l)	7.90	14.90	5.00	7.90	5-7 mg/l
10	CO ₂ (mg/l)	22.40	15.00	9.20	6.70	22 mg/l

In present investigation pH of river Krishna was highest 8.20 in the month of May and lowest 7.10 in the month of January and pH of river Venna was highest 7.60 in the month of May and lowest 6.30 in the month of January. Medera et al. reported that the pH of natural water ranges from 6.5-8.5. The water temperature of river Krishna ranges 31.600C (May) to 18.200C (January) and the water temperature of river Venna ranges 28.200C (May) to 17.000C (January). The fluctuations in water temperature may be due to influence of season and different timing of collection (Jayaraman et al.,2003).

In present study hardness of river Krishna was highest 270.00 mg/l in June and lowest 132.00 mg/l in November and hardness of river Venna was highest 57.00 mg/l in June and lowest 31.60 mg/l in November. Total hardness was high during summer than monsoon and winter reported by Hujare (2008). The maximum TDS value of river Krishna was 0.41 gm/l in July and minimum 0.20 gm/l in January and maximum TDS value of river Venna was 0.30 gm/l in July and minimum 0.09 gm/l in January. Increase in value TDS indicated pollution by extraneous sources (Kataria et al. 1996).

The phosphate content in river Krishna was found to be 9.10 mg/l in May and 5.60 mg/l in January and the phosphate content in river Venna was found to be 7.10 mg/l in May and 3.00 mg/l in January. Similar observation has been reported by Kamal et al. (2007) in their study on Mouri river. The level of nitrate in river Krishna was maximum 21.50 mg/l in January and minimum 7.80 mg/l in May and the level of nitrate in river Venna was maximum 10.80 mg/l in January and 5.80 mg/l in May. The higher limit of chloride in river Krishna was 47.3 mg/l in June and 18.00 mg/l in December and the higher limit of chloride in river Venna was 16.30 mg/l in June and 6.00 mg/l in December. Higher concentration of chlorides indicates higher degree of organic pollution.(Munawar, 1970).

The maximum alkalinity value of river Krishna was recorded in the month of June 274.00 mg/l and minimum in the month of November 210.00 mg/l and the maximum alkalinity value of river Venna was recorded in the month of June 51.30 mg/l and minimum in the month of November 33.00 mg/l. Das and Pandey (1978) reported that high alkalinity indicates pollution. In this study DO of Krishna river was highest 7.90 mg/l in June and lowest 5.00 mg/l in December and DO of

Venna river was highest 14.90 mg/l in June and lowest 7.90 mg/l in December. DO indicate the quality of water and organic pollution in the water body (Wetzel and Likens, 2006). CO₂ of river Krishna was 22.40 mg/l in May and 9.20 mg/l in January and CO₂ of river Venna was 15.00 mg/l in May and 6.70 mg/l in January. When the organic matter content of sewage in water was higher then it reduces oxygen content of water (Ragothaman and Trivedy,2002).

Conclusion:

The various physico-chemical parameters studied on Krishna river at sampling station Wai and on Venna river at sampling station Medha shows seasonal variations. The physicochemical parameters of river Krishna such as pH, temperature, nitrate, hardness, chloride, TDS are fall within a permissible limit of WHO and parameters such as alkalinity, phosphate, DO, CO₂ are exceeded the recommended limit of WHO. While all the physicochemical parameters except phosphate of river Venna are within the recommended limits of WHO.

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