

Study on Seasonal Alterations of Physico-Chemical Parameters of Seewan River MP India

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Abstract:- Water is very essential for sustaining life and is one of the most renewable resources on this planet for the existence of all living biota so it must be prevented from contamination and deterioration in quality. In the present study the seasonal variations in the physicochemical parameters of See wan River of Madhya Pradesh India has been carried out during the month of January to December 2017. Four sites were selected for the above work and physicochemical parameters were estimated by employing standard methods. Physicochemical parameters include pH by Digital pH meter, turbidity by digital Nephelo turbidity meter, temperature by mercury in glass thermometer, conductivity by conductivity meter, transparency by Secchi-disc, Dissolved oxygen by modified Winkler-azide method, water hardness by Lind Method total alkalinity by titration method free CO₂ by titration method, Biological oxygen demand by using BOD incubator, chloride by silver nitrate method, Odour and colour. Dissolved oxygen, BOD, pH, turbidity, hardness, transparency and chloride are most affected in summer, rainy and winter seasons. Insignificant changes in the values of temperature, alkalinity, colour, odour, and free CO₂ are also seen during different seasons. Therefore it has been found that dry season (summer) mean values of Dissolved oxygen, pH, calcium hardness, magnesium hardness, total hardness, transparency, electric conductivity, alkalinity is significantly higher as compared to rainy and winter seasons that affects the survivability of fishes in this season. Hence it has been studied that variations of physicochemical parameters of See wan River in different sites during different seasons are in correlation with the availability of population of fish biota.

Keywords:- Physicochemical Parameters, See Wan River, Seasonal Variations.

I. INTRODUCTION

The protection of fresh water fisheries from contamination has led to development of research for the water quality in terms of their physicochemical parameters such as Dissolved oxygen, Biological oxygen demand, total alkalinity, electrical conductivity, total hardness, transparency, free CO₂, PH, temperature, colour, etc. The productivity of aquatic biota depends on physicochemical parameters. The distribution and richness of the aquatic biota is determined by physicochemical parameters of water (Courtney and Clement, 1998; Unanam and Akpan, 2006). Parameters like BOD, COD, pH and temperature etc were studied seasonally and annually in order to understand quality of water (R.P.Chavan et.al.2006). Industrial effluents, agricultural runoff, and other contaminants affects the quality of surface and ground water. (Elayraja2003). Water quality in terms of physiochemical parameters and some nutrient levels in Shiroro Lake, Niger State.have been studied. Balarabe (1989), on Makwaye Lake, Zaria, Oniyet al., (2002),on Zaria Dam, Ugumba and Ugwumba(1993), on Awba Lake in Ibadan, Kolo and Oladimeji (2004), availability of good quality of water is an indispensable feature for preventing diseases and improving quality of life.(Oludoro and Aderia2007). The dynamic balance of physiochemical parameters is upset by anthropogenic activities results in pollution that disturbs the whole aquatic biota. Since good quality water is essential for getting maximum production as compared to poor quality water. An analysis was made on physiochemical parameters of Seewan River that is located in Seehore district of Madhya Pradesh. The Seehore district with an area of 6579 km² lying between the North Latitudes 22° 33' 30" and 23° 40' 25" and East Longitudes 78° 26' 00" and 78° 02' 00" and falls under survey of India toposheet NO, 55A, 55B, 55F and 55F. The district is enriched by Guna district in the north Vidisha and Raisen in the east, Hoshingabad and Dewas in the south, Shajapur and Rajgarh in the west. Seewan River flows through main town of Seehore District due to increasing industrialization, anthropogenic activities and fast population growth in Seehore District, the variations in the physico chemical parameters of different areas of See wan River has been observed. The main sources of pollution are domestic and municipal waste, agricultural Practices and industrial activities. Most of the localities in Seehore district do not have proper sewage treatment system so the river gets polluted with variety of nutritional constituents and pathogenic microbes. Use of various chemical fertilizers and pesticides has led to

increase of nitrates, phosphates and other organic component in river Untreated effluents discharged in river have caused increased level of heavy metals. Some organic Compounds have also led to deterioration of quality of water that has great impact on aquatic biota of that water body. Also the domestic use of water like bathing, washing and cattle bathing and many localities located on the nearby banks of river discharges wastes in to the river that leads to pollution and have great impact on aquatic biota especially fishes. In the present investigation an attempt has been made to study the seasonal variations of physicochemical parameters of See wan river.

II. METHODOLOGY

Water samples were collected from four sites of river flowing through seehore district in winter, summer and rainy seasons for a period of one year from [10 July to 25August 2017 rainy season] [20 November to 20 December 2018 winter season] [8 March to 10 April 2018 summer season]. Samples were collected in sterilized plastic bottles having one liter capacity well labeled samples were transported to lab for analysis of physicochemical parameters as per standard procedure (APHA 1998) Trivedi and Goal (1986). The sampling sites includes site1 upstream site 2 Hathi ghat site 3 mukhi ghat and site 4 is downstream and each site have 2km distance from each another. The parameters like total hardness, total alkalinity, conductivity, free CO₂, Dissolved oxygen, Biological oxygen demand, temperature, Ph, transparency, turbidity, chloride, colour, were analyzed by the methods (by Lind Method, by titration method, by conductivity meter EC214, by titration method, by modified Winkler-azide method by, BOD by using incubator, by mercury in glass thermometer by Digital pH meter 335 systronics, by Secchi-disc, by Silver nitrate method, by digital Nephelo turbidity meter 132.

III. RESULTS

Seasonal variations in physicochemical parameters viz., temperature, conductivity, total hardness, colour, odour, free CO₂, DO, BOD, alkalinity, chloride, transparency, turbidity, Ph, temperature, were recorded for a period of one year as shown in Tab 1. The temperature of river ranges between 28.22^oc (winter) to 33.07^oc (summer). The Ph of water was varying from 7.5 to 8.8 during the whole seasons. The odour of water was fishy during rainy and foul during dry season. The colour of water was observed green in rainy and brown in summer and winter. The electric conductivity of water sample was observed high in dry season 124.55mhos/cm as compared to rainy 110.22mhos/cm and winter 98.77mhos/cm the total; hardness varies between 190.56 to 449.64mg/l. the value of calcium hardness and magnesium hardness ranges from 100 to 170.33 and 100.10 to 308.44 mg/l.the turbidity varies from 100.11 to 220.44 during the study period.

The value of chloride ranges from 115.90 to 198.78 mg/l the alkalinity varies from 300.87 to 540.67 mg/l. the transparency ranges between 8.9 to 24.5m .the Dissolved oxygen ranges between 2.64 to 8.771 among the all values it was observed maximum in rainy and minimum in dry season. The Biochemical oxygen demand ranges between 6.99 to 15.33 and was maximum in dry season and minimum in rainy.

Parameters	Seasons	P1	P2	P3	P4	Min	Max
Tempt °C	RS	25.84	28.45	30.43	23.67	20.55	30.84
	SS	34.23	30.43	35.45	33.47	20.55	30.84
	WS	26.33	28.67°C	29.54°C	23.53	20.55	30.84
Odour	RS	Fishy	Fishy	Fishy	Fishy	fishy	Fishy
	SS	Foul	Foul	Foul	Foul	fishy	Fishy
	WS	Foul	Foul	Fishy	Foul	fishy	Fishy
Colour	RS	Greenish	Greenish	Greenish	Greenish	Greenish	Greenish
	SS	Brownish	Brownish	Brownish	Brownish	Brownish	Brownish
	WS	Greenish	Brownish	Greenish	Brownish	Brownish	Brownish
Conductivity mhos/cm	RS	124.55	120.55	124.55	125.43	100	110
	WS	125.22	110.22	99.55	105.55	100	110
	SS	95.33	94.66	98.77	98.67	100	110
Total hardness mg/l	RS	212.22	154.66	248.44	149.64	30.55	180.55
	WS	398.76	400.55	400.89	328.77	30.55	180.55
	SS	200.54	190.56	298.11	150.66	30.55	180.55
Calcium mg/l	RS	160.11	180.32	180.32	170.33	75.22	150.50
	WS	160.53	140.33	140.53	120.33	75.22	150.50
	SS	100.44	80.33	100.11	110.33	75.22	150.50
Magnesium mg/l	RS	252.11	274.34	288.22	258.44	20.56	200.77
	WS	238.23	260.22	260.46	308.44	20.56	200.77
	SS	100.10	110.23	198.00	140.33	20.56	200.77
Turbidity mg/l	RS	20.33	20.44	40.89	45.78	30.55	40.44
	WS	90.11	100.65	60.87	65.88		
	SS	43.11	20.60	33.81	45.81	30.55	40.44
Free co2 mg/l	RS	0.03	0.01	0.05	0.09	0.3	0.3
	WS	NF	1.00	0.5	0.5	0.3	0.3
	SS	NF	0.5	NF	0.2	0.3	0.3
Alkalinity mg/l	SS	140.67	300.56	380.34	380.77	50	300
	WS	300.87	120.78	20.99	30.66	50	300
	RS	20.66	40.55	20.11	80.88	50	300
Ph	SS	5.8	8.5	5.6	8.5	6.5	8.5
	WS	7.5	8.4	8.3	7.5	6.5	8.5
	RS	3.5	7.8	7.9	4.5	6.5	8.5
D/O mg/l	RS	2.56	3.80	4.78	6.15	5	10
	WS	5.88	4.77	4.66	6.44	5	10
	SS	2.67	4.78	4.77	3.56	5	10
BOD mg/l	WS	15.11	14.2 5	14.20	15.21	10	10
	WS	14.12	15.22	15.33	11.67	10	10
	RS	8.56	7.55	6.54	6.99	10	10
C l mg/l	RS	89.94	69.97	98.78	72.90	31.55	50.55
	WS	23.87	45.90	35.80	45.67	31.55	50.55
	SS	45.89	90.90	80.90	95.90	31.55	50.55
Transparency (m)	RS	30.0	35.6	30.9	34.5	20.10	35.5
	WS	10.9	12.9	11.8	9.7	20.10	35.5
	SS	8.9	10.7	9.6	7.6	20.10	35.5

Table 1:- 1ST YEAR:- Differential Distribution of physicochemical parameters of See wan river and minimum and maximum values of parameters for aquatic fishes.

Parameters	Seasons	S1	S2	S3	S4	Min	Max
Temp ^t °C	RS	28.44	24.12	22.23	25.45	20.55	30.84
	SS	32.20	35.30	33.45	30.17	20.55	30.84
	WS	14.23	15.17°C	19.51°C	18.22	20.55	30.84
Odour	RS	Foul	Fishy	Foul	Foul	fishy	Fishy
	SS	Foul	fishy	Foul	Foul	fishy	Fishy
	WS	Foul	Foul	Fishy	fishy	fishy	Fishy
Colour	RS	Greenish	Greenish	Greenish	Brownish	Greenish	Greenish
	SS	Greenish	Greenish	Brownish	Brownish	Brownish	Brownish
	WS	Greenish	Brownish	Greenish	Brownish	Brownish	Brownish
Conductivity mhos/cm	RS	123.15	120.25	122.51	124.33	100	110
	WS	115.12	111.12	95.34	98.25	100	110
	SS	93.13	92.56	95.18	98.33	100	110
Total hardness mg/l	RS	185.10	190.56	200.4	229.33	30.55	180.55
	WS	95.74	100.15	90.99	105.77	30.55	180.55
	SS	98.54	190.16	198.19	250.33	30.55	180.55
Calcium mg/l	RS	140.31	130.32	190.52	170.93	75.22	150.50
	WS	60.13	50.13	50.53	20.33	75.22	150.50
	SS	90.54	80.13	100.51	95.93	75.22	150.50
Magnesium mg/l	RS	250.55	280.99	290.29	299.54	20.56	200.77
	WS	228.13	210.52	290.86	300.44	20.56	200.77
	SS	10.15	9.83	13.00	15.33	20.56	200.77
Turbidity mg/l	RS	80.23	120.40	55.88	45.11	30.55	40.44
	WS	15.10	20.65	60.47	65.38	30.55	40.44
	SS	23.11	21.60	16.81	16.81	30.55	40.44
Free co ₂ mg/l	RS	1.01	1.02	2.09	1.09	0.3	0.3
	WS	NF	NF	1.5	1.5	0.3	0.3
	SS	NF	1.5	0.5	NF	0.3	0.3
Alkalinity mg/l	SS	420.55	200.59	350.31	180.17	50	300
	WS	300.87	440.18	440.13	310.16	50	300
	RS	30.16	30.15	20.19	50.11	50	300
Ph	SS	8.8	8.5	9.6	9.5	6.5	8.5
	WS	7.5	7.4	7.3	8.5	6.5	8.5
	RS	3.5	4.8	3.9	4.5	6.5	8.5
D/O mg/l	RS	2.55	5.90	3.78	1.55	5	10
	WS	3.11	3.55	2.11	4.34	5	10
	SS	3.65	1.75	4.17	3.96	5	10
BOD mg/l	RS	18.10	15.18	19.10	15.11	10	10
	WS	15.10	19.20	18.23	19.97	10	10
	SS	10.16	11.15	15.50	16.39	10	10
C l mg/l	RS	110.24	69.87	98.18	72.10	31.55	50.55
	WS	120.15	135.10	115.40	125.17	31.55	50.55
	SS	125.89	110.90	113.90	114.90	31.55	50.55
Transparency (m)	RS	39.1	32.6	38.2	28.5	20.10	35.5
	WS	11.9	13.9	12.8	19.7	20.10	35.5
	SS	18.9	20.9	19.6	17.6	20.10	35.5

Table 2:- 2ND YEAR Differential Distribution of physicochemical parameters of See wan river and minimum and maximum values of parameters for aquatic fishes

IV. DISCUSSION

During the study period the temperature of water ranges between 28.22^oc (winter) to 33.07^oc (summer). Aquatic fauna depends on water temperature range for their metabolism and hence for their growth (APHA, 1992). The low water temperature of different sites of river during summer season is due to seasonal changes in air temperature associated with dry winds. PH of water ranges between 7.5 to 8.8 hence water is alkaline in winter and summer seasons due to discharges of wastes from the main town and during rainy season addition of rain water dilutes the effect and maintains pH value. PH range of 6.09 to 8.45 is ideal pH for aquatic life especially fishes. Hence Ph value of water is within the acceptable level. Maximum summer season values of transparency are due to lack of agricultural runoff as well as suspended materials that occur by cessation of rainfall. Low transparency in rainy season is due to turbidity that reduces light penetration and hence photosynthesis is reduced that will reduce primary productivity

(APHA, 1992). Water hardness values of summer season at different sites of river are maximum due to low water level and more concentration of organic as well as inorganic wastes. The electric conductivity is maximum in rainy season due to runoff carrying silt that gets mixed in water as compared to summer as well as winter season. Maximum values of alkalinity in summer season is due to concentration of salts as well as ions and low water level while as minimum values of alkalinity in rainy season is due to dilution (Ufodik et,al 2001).Maximum values of dissolved oxygen was observed in rainy season and minimum in other seasons. Biological oxygen demand was maximum in dry season and minimum in rainy season. Maximum values of chloride were found in rainy season in rainy season precipitation eroded land containing wastes got mixed to water and increases the ion concentration.

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