

Effect of physico- chemical parameters of selected rural, urban ponds and river of Raipur District

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ABSTRACT

Physico- chemical parameter plays a major role in determining density diversity and occurrence of aqua life in water. The present paper was dealing / represents the water quality of river, rural and urban ponds of district Raipur, Chhattisgarh, India. Results showed that concentration in physico- chemical parameters (temperature, transparency, pH, DO, Free carbon dioxide, alkalinity and total hardness) during the period of March' 2018 to June'2018 in summer season. The physico- chemical parameters influencing the aquatic productivity of water bodies were found in range of temperature, transparency, pH (6.5-8.5), free carbon dioxide, dissolved oxygen (5.2-7.5mg/l), Total hardness (68-190mg/l) and alkalinity are found in range and it is suitable for drinking and aqua culture.

Index Terms - Urban and rural pond, Raipur, physico-chemical parameters

INTRODUCTION

River and ponds are natural resources of fresh water. In Chhattisgarh so many rivers. Kharun river was one of the most important resource of fresh water in Chhattisgarh. The capital of Chhattisgarh was Raipur which was situated near the Kharun river. Around the area many small /big water resource situated like – urban and rural ponds. Rivers play an important role in the development of nation and sustenance of life, which are being polluted due to rapid industrialization, urbanization and other -developmental activities (Alam and Pathak, 2010; Mandal and Amrita, 2011). Indian agriculture receives most of its water from surface sources like river, reservoir, dam, etc., (Thitame and Pondhe, 2010). The interactions of both the physical and chemical properties of water play a significant role in composition, distribution and abundance of aquatic organisms (Saxena *et al.*, 2011). Temperature, turbidity, dissolved oxygen, pH, chloride, and total alkalinity are significant parameters used to study the quality of water (Patil 2012). Fish assemblage, structure and functions are also associated with geographic variations which have to be understood for the effective assessment and monitoring of rivers. Fisheries sector plays an important role in the Indian economy by way of contributing to the national income, employment and foreign exchange. It has a vast potential for fish resources both from inland and marine environment. India has about 1.6 million hectares of freshwater lakes, ponds, and swamps and nearly 64,000 kilometers of rivers and streams. The economic liberalization policies initiated in 1991 opened up new opportunities for fisheries growth. The production has increased from 0.6 million tonnes, to 6.0 million tonnes, out of which inland fisheries contributes 45.4%.

MATERIALS AND METHODS

In order to determine certain physico- chemical properties of water, its sampling was collected in summer season month of March'2018 to June'2018. The water sample were collected from river, urban and rural natural resources from Raipur district. Sample collection time was 6.00 am. Sample site-1- Kharun river (Atari village near Nandanvan Raipur), site- 2 Chherikheri pond (rural pond -Dharsiva block), site-3 Navagaon pond (urban pond - Naya Raipur). Physical parameters were analyzed in different method under laboratory.

RESULTS AND DISCUSSION

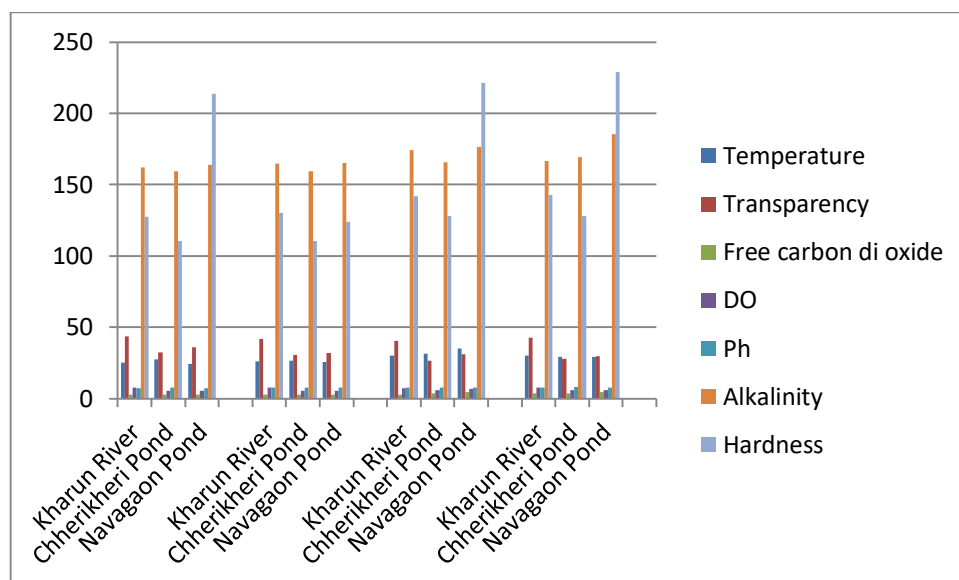
The result obtained by physico- chemical analysis of all samples given in Table-1

Water Temperature

Temperature was one of the most important factors in the aquatic environment (Dwivedi and Pandey, 2002). It affects the physical and chemical properties of water and also affects the vegetation, organism and their biological activities. According to Welch, 1952 the smaller water body, more quickly it reacts to changes in the atmospheric temperature. The highest temperature was recorded in Navagaon pond in the month of May' 2018 and lowest temperature was recorded in the month of March'2018 at Kharun river similar findings also reported by Sajitha et al., 2016. Salve and Hiware, 2006 observed that during summer, water temperature was high due to low water level and clear atmosphere. Kharun River temperature recorded range 25 °C to 30 °C similar observation reported by Sujitha et al., 2012 on river of Kerala, India.

Table1. Physico-chemical condition of water in selected water bodies in summer season of year -2018

S.No.	Sites	Month	Physico-chemical condition of water bodies						
			Temperature (O°C)	Transparency (cm)	Free carbon di oxide (mg/l)	DO(mg/l)	pH	Alkalinity (mg/l)	Hardness (mg/l)
1	Kharun River		25.00	43.67	2.60	7.60	7.37	162.00	127.67
	Chherikheri Pond	Mar'18	27.33	32.33	2.81	5.44	7.57	159.33	110.67
	Navagaon Pond		24.33	36.00	2.67	5.51	7.17	164	213.67
2	Kharun River		26.00	41.67	2.80	7.50	7.53	164.67	130.33
	Chherikheri Pond	April'18	26.67	30.67	2.81	5.44	7.57	159.33	110.67
	Navagaon Pond		25.67	32.00	2.93	5.36	7.53	165.33	124.00
3	Kharun River		30.00	40.33	2.67	7.42	7.57	174.00	141.67
	Chherikheri Pond	May'18	31.33	26.67	3.43	5.73	7.67	165.67	128.00
	Navagaon Pond		35.00	31.00	4.60	6.76	7.77	176.33	221.33
4	Kharun River		30.00	42.67	3.40	7.55	7.67	166.67	142.67
	Chherikheri Pond	June'18	29.33	27.67	3.61	5.68	8.00	169.33	128.00
	Navagaon Pond		29.33	29.67	4.40	5.92	7.87	185.33	229.00



Water Transparency

Ability of water to transmit the light that can optimize was termed as transparency. During summer season range of transparency was 26cm to 43cm in ponds and river. The transparency in Kharun River was recorded maximum 43.67cm in the month of June' 2018 and minimum transparency 26.67cm was recorded in the month of May' 2018 at Chherikheri pond. Transparency was unusually high in river which was similar to Ayyappan, 2006, The transparency in pond ranged 30-35cm with an annual mean \pm S.D. of 40-60 cm.

Water pH

In natural waters, the pH scales runs from 0- 14. A pH value of 7 was neutral; less than 7 was acidic and greater than 7 represent base alkalinity. The magnitude of fluctuation of pH depends on buffering capacity (total alkalinity of water) and rates of photosynthesis, respiration (Boyd, 1990). The present study pH range was observed between 7.10 – 7.93 at ponds and river similar observation reported by Sujitha et al., 2012 and Krishnakumar, 1998 which indicate the favorable condition of productivity. Highest pH- 8 was observed in Chherikheri pond in the month of June'2018 similar range was observed by Sony and Bhatt while studying the ecology of pond near Vadodara, Gujarat found an average pH of 7.15 during summer and minimum pH- 7.17 was observed in the month of March' 2018 in Kharun river. The permissible limit of pH in drinking water was within 6.5 – 8.5 according to Bureau of Indian Standard (BWS). According to (Boyd and Pillai, 1984) better fish production could be possible in pond water with pH value ranging between 6.5 to 9.0.

Dissolved Oxygen

Dissolved oxygen was indicating healthy aquatic system. Dissolved oxygen has primary importance in natural water as limiting factor because most organisms other than anaerobic microbes die rapidly when oxygen levels in water becomes low or falls to zero. The permissible value recommended for DO was 5mg/L as per Indian standard. Boyd, 1982 the optimum concentration of DO in pond water was 6 to 9 mg/L. The maximum observation of DO range 7.6 mg/l obtained at Kharun River during summer season in the month of March' 2018 similar observation reported by Sajitha and Vijayamma , 2016 and minimum observation found at Navagaon pond range 5.36mg/l in the month of April' 2018. Meme et al., 2014 was reported the range of dissolve oxygen was 6.02 to 7.01 mg/l at Oinyi River, Nigeria.

Free carbon dioxide

At Present study the free CO₂ level was 2 mg/l to 4mg/l recorded in ponds and river water. According to Goel and Trivedi, the increase in organic matter results in high biological and chemical demands, decreasing the DO levels and consequently increasing the free carbon-dioxide. During the summer season highest concentration of free CO₂ range 4.6mg/l recorded at Navagaon pond in May' 2018 and minimum range was 2.6mg/l in the month of March' 2018 at Kharun river. Das and Chand, 2003 reported similar observations in a community pond in Ganjam district in Orissa.

Total Water Alkalinity

Alkalinity in most natural water was the function of bi-carbonate and carbonates. Their salt gate hydrolyzed in solution and produced hydroxyl ions. It was also used as a measure of productivity (Hulyal and Kaliwal, 2008). The alkalinity was high during the summer seasons. Adebisi, 1980 showed alkalinity to be inversely correlated with the water level. The permissible value of alkalinity as recommended by the Indian standards was 250 mg/L as CaCO₃. Total alkalinity fluctuated in experimental water bodies, generally lower than the range (100 to 120 gm/L) suggested by Tripathi, 1982. At present study the range of alkalinity was 159 – 185 mg/l in at selected water bodies in summer season. The observation maximum 85.33mg/l at Navagaon pond in the month of June' 2018 and minimum 159.33mg/l observed in Chherikheri pond in the month of March and April' 2018.

Total hardness of water

Hardness of water was a measure of its capacity from precipitate with certain anions present in water. During study period in year- 2018 the total hardness of water range was 110mg/l to 229mg/l in selected water bodies. The highest value-229mg/l was observed in Navagaon pond in the month of June' 2018 similar observation reported by Sajitha and Vijayamma , 2016 and minimum value 110.67mg/l observed in the month of March and April' 2018. According to APHA the desirable limit for total hardness was 300 mg/l. Mishra et al., 2014 studied the pond water quality in Rairangpur , Varanasi and found that the hardness values varied from 146 to 268mg/l.

Conclusion

The present study of physico- chemical parameters of selected rural Chherikheri pond), urban (Navagaon pond) and river (Kharun river (Atari village near Nandanvan) of Raipur district was carried out during summer season (March – June' 2018) by taking important physic- chemical parameters like pH, temperature, transparency, dissolved oxygen, free carbon dioxide, total alkalinity and total hardness was found in permissible limit. Hence selected rural, urban ponds and river of Raipur district is suitable for irrigation, drinking and pisciculture .

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