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## A STUDY ON PHYSICO CHEMICAL PARAMETERS OF RIVER, URBAN AND RURAL PONDS OF RAIPUR DISTRICT

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### ABSTRACT

Present paper deals with the study of physico- chemical parameters of river, rural and urban ponds of Raipur district during the summer season for period of March 2017 to June 2017. Study of physical and chemical parameters such as 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 investigated. All parameters were under permissible limits. All selected water bodies are suitable for fish culture.

#### Key Words:

Physicochemical, Water,  
River, Pond.

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## INTRODUCTION

Aquatic environment are valuable natural assets. Aquatic ecosystem is most diverse ecosystem in the world. Water pollution caused by our own activities has already set the process of destruction in motion and if it is not controlled, our survival will be at stake. Global aquatic ecosystem fall under two broad classes defined by saline and fresh water ecosystem. Fresh water ecosystems are inland waters have low concentration of salts. It is rich for aquatic life means it has many interesting aquatic animals and aquatic plants. The term water quality is defined those physical, chemical and biological characteristics by the water quality is a major factor in determining the welfare of the society (Dwivedi and Pathak, 2000). Pollution means contamination of environment. The initial effect of pollutants is to degrade physical quality of the water. Later biological degradation becomes evident in terms of number, variety and organization of the living organism in the water (Gray; 1989). Fresh water environment are highly diversified and marked by a wide range of physico-chemical condition which greatly influence the life of water fluctuation in physico-chemical condition adversely affect the organism

limiting their production and interfering in physiological process which reduce their ability to compete with other population within the environment. Fresh water has become a scarce commodity due to over exploitation and pollution (Ghosh and Basu, 1968; Patil and Tijare, 2001; Singh and Mathur, 2005; and Gupta and Shukla, 2006). Any type of chemical imbalance cause big loss/disease in fish population on their habitat. There is a very close relationship between the metabolism of aquatic organism and hydro biological parameters in a fresh water body (Deshmukh and Ambore, 2006). Raipur district of Chhattisgarh is an important area of high tech agriculture, the pesticide consumption is also comparatively high. Pesticides are used specially for cultivation of paddy, wheat, soybean, groundnut, chickpea etc. Indian agriculture receives most of its water from surface sources like river, reservoir, dam, etc., (Thitame and Pondhe, 2010). Fishes are good indicators of pollution stress and have wide range of tolerance. Fishes respond to change in physical, chemical and biological conditions of aquatic ecosystem caused by human activities (Plafkin *et al.*, 1989)

## MATERIALS AND METHODS

In order to determine certain physico- chemical properties of water, its sampling was collected in summer season month of

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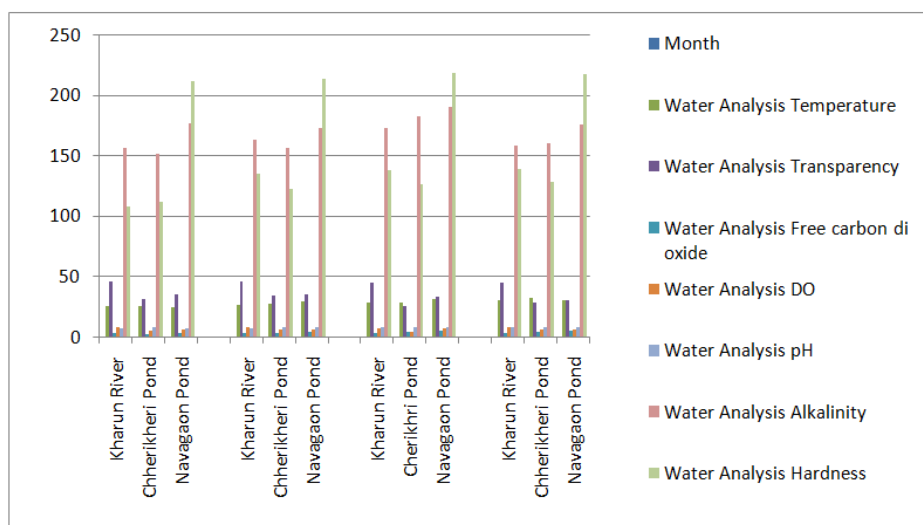
March'2017 to June'2017. The sample were collected from river, urban and rural three different water bodies from Raipur district. Sample collection time is 6.00 am. Sample site-1-Kharun river (Atari village near Nandanvan Raipur), site- 2 Chherikheri pond (rural pond -Dharsiva block), site-3 Navagaon pond (urban pond - Naya Raipur). Physical parameter such as temperature was measured by digital thermometer and for turbidity use sacchi disc. The chemical parameters were analyzed different titration method in laboratory.

## RESULTS AND DISCUSSION

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

**Table 1. Physico-chemical condition of water in selected water bodies year – 2017**

S.Q	Sites	Month	Water Analysis						
			Temperature (O°C)	Transparency (cm)	Free carbon di oxide (mg/l)	DO (mg/l)	pH	Alkalinity (mg/l)	Hardness (mg/l)
1	Kharun River	Mar'17	25.00	46.00	2.47	7.53	7.13	155.67	108.00
	Chherikheri Pond		25.33	31.33	2.11	5.23	7.27	151.33	111.67
	Navagaon Pond		24.33	34.67	3.01	5.77	7.10	176.00	211.00
2	Kharun River	April'17	26.00	45.67	2.73	7.57	7.23	162.33	135.00
	Chherikheri Pond		27.20	34.00	2.67	5.33	7.43	156.33	121.67
	Navagaon Pond		29.47	34.67	3.80	5.53	7.30	172.67	213.33
3	Kharun River	May'17	28.33	44.33	2.80	7.08	7.30	172.00	137.67
	Chherikheri Pond		28.33	25.67	4.17	3.56	7.70	182.33	126.00
	Navagaon Pond		31.00	33.00	4.80	6.65	7.57	189.67	217.67
4	Kharun River	June'17	30.00	44.67	3.13	7.40	7.40	157.67	138.67
	Chherikheri Pond		31.67	28.00	4.21	5.79	7.93	159.67	127.67
	Navagaon Pond		29.67	30.00	4.70	5.77	7.90	175.33	217.00



**Fig. 1. Physico chemical characteristics of Kharun river, Chherikheri pond and Navagaon pond in year- 2017**

### Water Temperature

Temperature is one of the most important and essential parameter of aquatic habitats because almost all the physical, chemical and biological properties are governed by it. Temperature is 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 there biological activities. Temperature values study of Raipur district pond temperature is higher in month of June. According to (Welch, 1952) Smaller the body of water, more quickly it reacts to changes in the atmospheric temperature. In the present study, Water temperature was found in the range of 24°C to 32°C. The

highest temperature is recorded in Chherikheri Pond. (Salve and Hiware, 2006) observed that during summer, water temperature was high due to low water level and clear atmosphere.

### Water Transparency

Ability of water to transmit the light that can optimize is termed as transparency. During summer season range of transparency is 26cm to 46cm. The transparency in Kharun River (Atari village near Nandanvan Raipur) is maximum. Transparency was unusually high in river. Transparency range of Navagaon pond (Urban pond) is 30cm to 35cm which is similar to (Ayyappan, 2006, The transparency in urban pond ranged 30-35cm with an annual mean±S.D. of 40-60 cm).

### Water pH

pH is a measure of hydrogen ion concentration present in water. 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 is observed between 7.10 – 7.93 which indicate the favorable condition of productivity. Highest pH was observed in Navagaon pond. Similar range was observed by Sony and Bhatt while studying the ecology of an urban pond near Vadodara, Gujarat found an average pH of 7.15 during summer. The permissible limit of pH in drinking water is within 6.5 – 8.5 according to Bureau of Indian Standard (BIS). 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 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. Dissolved oxygen is the most crucial factor for the growth and survival of fish. The optimum concentration of DO in pond waters is 6 to 9 mg/L (Boyd, 1982). The DO range of 4mg/l to 8 mg/l obtained at Kharun River during summer season. (Meme *et al.*, 2014) reported the range of Dissolve Oxygen was 6.02 to 7.01 mg/l at Oinyi River, Nigeria.

### Free carbon dioxide

Free carbon dioxide, a highly soluble gas in water, is contributed by respiratory activity of the aquatic community and can exist in water as bicarbonate or carbonates in the dissolved or bound form in earth crust. At Present study the free CO<sub>2</sub> level was 2 mg/l to 5mg/l recorded. 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 CO<sub>2</sub> recorded at Navagaon pond (urban pond). (Das *et al.*, 2009) while assessing the ecology of a flood-plain wetland of Kalyani, an industrial area of WB, found the maximum CO<sub>2</sub> to be 40 mg l<sup>-1</sup>. (Das and Chand, 2003) reported similar observations in a community pond in Ganjam district in Orissa.

### Total Water Alkalinity

Alkalinity is the water's ability to resist changes in pH and is a measure of the total concentration of various bases in pond water including carbonates, bicarbonates, hydroxides, phosphates, borates and other compounds in the water. Alkalinity in most natural water is the function of bi-carbonate and carbonates. Their salt gate hydrolyzed in solution and produced hydroxyl ions. It is 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 is 250 mg/L as CaCO<sub>3</sub>. 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 151 – 190 mg/l.

### Total Hardness of Water

Hardness is the measure of alkaline earth elements such as calcium and magnesium in an aquatic body along with other ions such as aluminium, iron, manganese, strontium, zinc, and hydrogen ions. In year- 2017 the total hardness of water range was 108mg/l to 218mg/l in study area. The highest value was observed in Navagaon pond (urban pond). According to APHA the desirable limit for total hardness is 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

A study of physico – chemical parameters of Raipur district was carried out by taking important parameters like

Temperature, Transparency, pH, Dissolved oxygen, Free carbon dioxide, Total alkalinity and Total hardness for the period of March 2017 to June 2017 during summer season. In the present investigation that different study area river, rural pond and urban pond of Raipur district water are suitable for pisciculture, irrigation and drinking purpose.

### REFERENCES

- Adebisi AA. The physico-chemical hydrology of a tropical seasonal upper Ogun river. *Hydrobiol.* 1980; 79:157-165.
- APHA, 2005. Standard Methods for the Examination of water and wastewater. American Public Health Association, Washington D. C., 1000p.
- Ayyappan, S., Jena, J.K. and Pandey, A.K. 2006. Handbook of Fisheries and Aquaculture, 438- 441.
- Boyd CE, Pillai VK. 1984. Water quality management in aquaculture. CMFRI, Spl. Pub. 22:1-96.
- Boyd CE, Tucker CS, 1990. Pond Aquaculture Water Quality Management. *Kluwer Academic Publishers, Boston.* 1998, 87-153.
- Boyd CE. 1982. Water quality management for pond fish culture. Elsevier Science Publishing Company, New York.
- Das SK, Biswas D, Roy S. Study of hydrophytes in some lentic water bodies in West-Bengal, India. *Ecological Society (ECOS), Nepal.* 2009; 16:9-13.
- Das SK, Chand BK. Limnology and biodiversity of Ichthyo fauna in a pond of Southern Orissa, India, *Journal of Ecotoxicology and Environmental Monitoring.* 2003; 13(2):97-102.
- Deshmukh, J.G. and Ambore, N.E. 2006. Seasonal Variation in physical aspects of pollution in Godavari river at Nanded Maharashtra. *India. J.Aqua Biol.* 21(2): 93-96.
- Dwivedi, S.L. and Pathak, V. 2000. Studies of water quality of Mandakini rules in Chikrakoot for irrigation purpose. *Indian J. Env. Prof.* 27(8):757-754.
- Gary, L. 1989. Geographical distribution morphology and water quality of Caldera Lakes; a review *Kluwer. Academic publisher, Hydrobiologia* 171: 23- 32.
- Ghose, F., Basu, P. 1968. Eutrophication trends in water quality of the Rhode river. *J. Mar. Biol. Assoc.* 54: 825-855.
- Goel PK, Trivedy RK. Some conservation on sewage disposal to freshwaters and resultant effects. *Journal of Pollution Research.* 984; 3(1):7-12.
- Gupta, G.K. Shukle, R. 2006. Physicochemical and Bacteriological quality in various sources of drinking water from Auriya Distt. (U.P) Industrial area. *Pollution Researches,* 23(4): 205-209.
- Hulyal SB, Kaliwal BB. Water quality assessment of Alamatti reservoir of Bijapur with special reference to zooplankton. *Environmental Monitoring and Assessment.* 2008; 139:299-306.
- Jayabhye. U.M.; Pentewar, M.S. and Hiware C.J, 2006: A study on physicochemical parameters of minor reservoir, Swana, Hingoli district, Maharashtra.
- Meme F.K., Arimoro F.O. Nwaduikwe, 2014. Analyses of Physical and Chemical Parameters in Surface Waters nearby a Cement Factory in North Central, Nigeria. *Journal of Environmental Protection.* 5:826-834.
- Mishra, S., A. L. Singh and D. Tiwary, 2014. Studies of Physico-chemical Status of the Ponds at Varanasi Holy City under Anthropogenic Influences. *Int. J. Environ. Res. Devel.* 4: 261-268.

- Patil, D. B. and Tijare, R. V. 2001. Studies on Water Quality of Godchiroli Lake. *Pollution Research*, 20, Pp 257-259.
- Plafkin, J. L., Barbour, M. T., Porter, K. D., Gross, S. K and Hughes, R. M., 1989. Rapid bio-assessment protocols for use in streams and rivers: Benthic macroinvertebrates and Fish. Environmental protection agency EPA/440/4-89/001, Washington, DC, USA.
- Salve B.S and C.J. Hiware, 2006. Studies on water quality of Wanparkalpa reservoir, Nagapur, Near Paril Vaijinath, District beed, MARATHWADA REGION, *J Aqua. Bio.*21 (2): 113-117.
- Singh, R.P. and Mathur, P. 2005. Investigation of Variation in Physico-Chemical Characteristics of a Fresh Water Reservoir of Ajmer city, Rajasthan. *Indian Journal of Environmental Science*, 9, pp 57-61.
- Soni RN, Bhatt SA. Periodical Ecological study of an urban pond near Vadodara, Gujrat, India. *Proceedings of Taal 2007. The 12th World lake conference*: 1591-1596.
- Thitame, S. N and Pondhe, G. M., 2010. Assessment of seasonal variation in physico- chemical characteristics and quality of Pravara River water for irrigation use in Sangamner, Ahmednagar, Maharashtra. *J. Chem. Pharm. Res.*, 2(2): 316-320.
- Tripathi, CKM. 1982. Investigation on Ganga river to determine biological indicators of water quality. Ph.D. Thesis, Banaras Hindu University, Varanasi.

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