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Study on water quality index of different sites of few rivers of Jharkhand State, India

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Abstract- In the present work an attempt has been made to study the water quality index in selected river system (namely- Harmu river, near Nagadi Block, Ranchi; Swarnarekha river, near Namkum; and Damodar River, near Ramgarh, Dhanbad, Barakar and Bokaro) with a purpose to assess its suitability for fish growth and other purposes. The physico-chemical parameters studied were DO₂, free CO₂, water temperatures, pH, K⁺, Na⁺, Ca⁺, Cl⁻, SO₄, PO₄ and alkalinity etc. The difference in DO₂ at different sites were statistically significant (P<0.05). Bokaro site of the river Damodar seem to be most suitable for fish growth and development but Ramgarh site was most unfavourable as evidenced by comparable study of water quality index. The details have been discussed in this paper.

Key words: Water quality index, river systems, Jharkhand state

INTRODUCTION

One of the prerequisites for successful pisciculture is water, which should be enriched with nutrients and therefore for intensive fish culture, the pollution free ponds/ water bodies are fertilized with inorganic fertilizers. Fish are in equilibrium between potential disease organisms and their environment. Changes in this equilibrium such as deterioration in water quality can result in fish becoming stressed and vulnerable to diseases. It is therefore very important to know something of water quality parameters that have influence on better growth and survival of aquatic organisms. A complete understanding of the relationship between water quality and aquatic productivity is a prerequisite for optimum growth and production. Jharkhand state has good resources of water bodies but reliable data

on its water quality pertaining to physico-chemical parameters are not available. Therefore, the present work is an endeavour to evaluate the water quality (Physico-chemical) parameters at different sites (specially Harmu river, near the Nagadi Block, Ranchi; Swarnarekha river, near Namkum and Damodar River near Ramgarh, Dhanbad, Barakar and Bokaro) of Jharkhand state to assess its suitability for fish production.

MATERIAL & METHODS

For the present study six sites of water bodies (as mentioned in above para) were selected. Water samples were collected in 500ml plastic bottles during the period March, 2023 during morning hours around 8.00am. The different parameters of water samples were determined for their analysis as per the methods reported by APHA *et al.* (2012)¹ and Bano (2022)².

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RESULTS

The data showing physico-chemical parameters of water samples collected from six different experimental sites have been recorded in Table-1 and graphically shown in Fig. 1. A perusal of the table-1 indicated that pH and

alkalinity values showed nominal fluctuations, inorganic constituents (i.e. K^+ , Na^+ , Ca^{+2} , Cl^- , SO_4^{2-} , and PO_4^{3-}) values did not show any statistically significant variations, the DO (dissolved oxygen) showed wide variations being highest in River Damodar near Bokaro (9.2 mg/l) and lowest in Harmu River (4.2 mg/l).

Table 1-Physico-Chemical Parameters of Water Samples Collected from Different Experimental Sites (Month : March)

Sl. No.	Parameters Expt. Sites	Temp. (°C)	pH	Alkalinity (mg/lit)	DO (mg/lit)	Free CO ₂	K ⁺ (ppm)	Na ⁺ (ppm)	Ca ²⁺ (ppm)	Cl ⁻ (ppm)	SO ₄ ²⁻ (ppm)	PO ₄ ³⁻ (ppm)
1.	Harmu River	24.0±1.35	7.3±0.63	194±16.3	4.2±1.83	Not checked	0.010±0.008	0.016±0.006	0.018±0.005	1.58±0.09	0.023±0.007	0.4±0.04
2.	River Swarnarekha, Namkum	24.0±1.89	7.4±0.71	190±17.8	8.4±1.08	Not checked	0.012±0.009	0.018±0.007	0.020±0.004	1.93±0.01	0.32±0.005	0.3±0.07
3.	River Damodar Ramgarh	24.2±1.18	7.5±0.61	199±13.8	7.6±0.98	Not checked	0.013±0.005	0.018±0.006	0.13±0.7	1.0±0.009	0.020±0.007	0.08±0.009
4.	River Damodar Dhanbad	23.8±1.45	7.1±0.68	1708±16.8	8.6±0.93	Not checked	0.011±0.005	0.017±0.007	0.012±0.06	1.60±0.08	0.019±0.005	0.07±0.06
5.	River Damodar Barakar	23.8±0.215	7.0±0.6	168±13.8	8.7±0.53	Not checked	0.014±0.006	0.017±0.005	0.019±0.004	1.50±0.1	0.022±0.008	0.20±0.05
6.	River Damodar Bokaro	24.1±1.2	7.2±0.67	172±14.1	9.2±1.97	Not checked	0.013±0.004	0.014±0.003	0.19±0.06	0.70±0.04	0.018±0.005	0.11±0.07

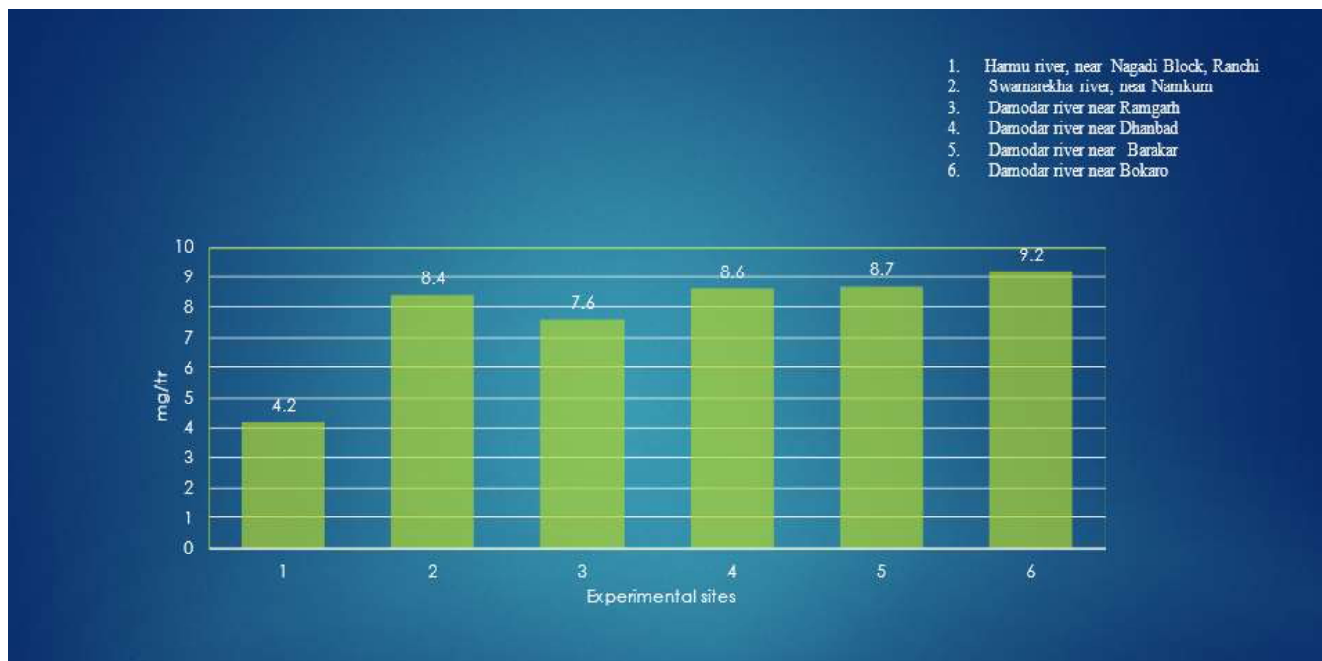


Fig. 1- Concentration of dissolved oxygen (mg/liter) in the water sample collected from different experimental sites

DISCUSSION

The study of physico-chemical characteristics of water is an important aspect of ecological study of water bodies. It is not easy to understand the biological activities and productivity of water body without adequate knowledge of water chemistry. Water effects life through its physico-

chemical properties which are important factors of particular ecosystem.³ Physico-chemical parameters are highly important with regards to the occurrence and abundance of species.⁴ In the study of limnology the physico-chemical parameters are considered as basic in

understanding the trophic dynamics of water body. Each factor plays its own role but at the same time the final effects is the result of interaction of all such factor.^{4,5} A perusal of literatures indicates that good number of investigators have studied water quality parameters but water quality index of different river sites of Jharkhand state could not get proper attention of scientists as such this study owes its own importance.^{2,4,6-9} In the present study DO₂ ranged between 4.2 to 9.2 mg/l. A good water should have DO₂ of 7.6 mg/l at 30°C.¹⁰ Values of alkalinity in test water ranged between 168.0 to 194.0 mg/l. For surface waters, alkalinity may result from waste discharged from adjoining are and microbial decomposition of organic matters present in the water body.¹¹ Thresh *et al.* (1944)¹² reported that the presence of high chloride content in the water is indication of pollution derived from the animals. In the present study low chloride content (Table-1) could be attributed to the influx of drainage water during flood time. Other components like, carbonate, calcium and bicarbonate etc. in the river were well within the range reported for other water bodies.^{2,9} Dissolved O₂ content of all the six different sites were statistically significant.² Water quality index at Bokaro site were comparatively better than other sites taken into account and are better for exploitation of fish culture. Further studies on this aspect require further investigation.

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