

# Study of Physicochemical Properties of Freshwater Body Located at Madhepura District of Bihar

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## ABSTRACT

In order to better understand the current situation and plan for its future use, the current research examines the seasonal fluctuations in some significant physico-chemical parameters and biological investigations of the three rural ponds in Madhepura, Bihar. The data gathered during different seasons (summer, winter, and rainy study) showed that the studied parameters were within acceptable limits for fish culture and the stocking should be done in accordance with the productivity of the water. Yet, a statistical examination of the data shows that the physicochemical characteristics of certain ponds were responsible for significant environmental benefits. Our study emphasizes the importance of community involvement and effluent disposal education. Our investigation of the ponds' BOD shows that they are somewhat polluted, which has to be fixed in the future for higher productivity.

**KEYWORDS:** *Physicochemical, pH, BOD, DO, Water Body*

## INTRODUCTION

Freshwater resources are used for agricultural, industrial, domestic, recreational, and environmental activities to support the healthy growth of human civilization. For the life on our planet, fresh water supplies are actually quite valuable. Over the past few years, there have been a lot more dams, reservoirs, tanks, and other structures built. The current requirement employing scientific methods is the development of fisheries in these freshwater resources. In order to periodically assess the pollution level of the water bodies, limnological investigations on the water bodies were typically analyzed. The type and quantity of aquatic life that can exist in a body of water depends on both its abiotic and biotic characteristics. Water plays a special significance in nature, not just for humans but also for the many different organisms that live there. The meteorological, geochemical, geo-structural, and pollution conditions are what define the physical and chemical characteristics of freshwater bodies. (Choudhary et al., 2014). It is crucial to research the

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Physico-Chemical parameters impacting the biological productivity in the water bodies in order to successfully use fresh water bodies for fish production (Sahni and Yadav, 2012). The pond's water quality has a direct impact on the type of aquatic species that may survive there. Although there have been numerous studies in this area in recent years, there is little information available on the physicochemical and biological properties of the current water bodies (Yadav et al., 2013). Physical and chemical information about these ponds utilised for fish culture is not accessible. Thus, the current work is an effort to explore in depth several significant Physico-Chemical parameters of the rural water body in Madhepura, Bihar.

## Materials and Methods

Water sample were collected from selected freshwater water body situated at residential area of Madhepura District of Bihar. Monthly sampling was done from June 2021 to May 2022 in selected for finding out the

various abiotic (temperature, transparency, pH, dissolve oxygen, free CO<sub>2</sub>, total alkalinity, BOD) and biotic parameters. The physico-chemical analyses of the water samples were done according to APHA

(1998). The data collected were grouped into three categories i.e. summer (February-May), Rainy (June-September) and winter (October –January) for comparison of seasonal variations.

## Result and Discussion

At first, the morphology i.e. shape, embankment, pond bottom type, mean depth and microphyte infestation of selected water body was measured. Waterbody possess earthen embankment and muddy bottom. Marginal weeds have infested the pond considerably. Waterbody was perennial, non-drainable, utilized for bathing, washing clothes and utensils.

Si. No.	Shape	Embankment	Depth	Area	Bottom	Macrophyte infestation
1	Semi Circular	Earthen	3meters (approx.)	1 hectare (approx.)	Muddy	50%

**Table 1 shows the morphological status of selected water body**

S.N.	Parameters	Water body		
		Summer	Rainy	Winter
1	Air Temperature(°C)	32.47±2.0	26.3±2.1	24.2±2.1
2	Water Temperature (°C)	27.6±0.8	23.4±1.5	21.95±1.5
3	pH	8.3±0.4	7.9±0.3	7.35±0.25
4	Dissolved oxygen (ppm)	8.1±0.4	9.8±0.3	9.4±0.2
5	Free Carbon dioxide(ppm)	14±2.0	17±3	19±3
6	Alkalinity(ppm)	193±5	219±3	200±3
7	Secchi disc transparency (cm)	28.8±1.5	37±3.0	29.9±2.0
8	Hardness(ppm)	117±3	89±5	106±2.5
09	Total Dissolved solids(ppm)	163±10	170±8.0	151±6.0
10	Biological oxygen demand(ppm)	2.71±0.4	2.72±0.5	2.19±0.6

**Table 2 Shows the seasonal physicochemical parameters (average) recorded in selected water body.**

### Temperature

The operation of the aquatic ecosystem is greatly influenced by temperature, which also plays a significant role in the aquatic environment. Singh and Mathura (2005), Dwivedi and Pandey (2002), and Wetzel (1975). Seasonal variations in the air and water temperatures have been noted in the current investigation. The water was between 23 and 27 degrees Celsius, while the air was between 25 and 31 degrees Celsius. It was at its highest during the summer and at its lowest during the winter. Similar outcomes to those revealed in the current investigation were also discovered by Kannan and Job (1980). Even if the minimum temperature observed in the month of December (16<sup>0</sup> C) is also within the permissible limit for fish culture, the temperature rages suggest the suitability for fish culture (Jhingran, 1982). There are no substantial variations in the water temperature since the water bodies are so huge.

### pH

The limiting factor pH also serves as a gauge of the state of the environment in general. The pond's pH value indicated an alkaline tendency. The maximum pH value was 8.5 in the month of April and the lowest was 7.85 in the month of October. The results clearly show that the pH rises throughout the summer and

decreases during the rainy season. The aquatic environment's pH state is one of the key chemical factors that determines whether it is suitable for fish culture. Fish culture is good for the alkaline pH. (Jhingran, 1982). Overall, the pH was the same and a bit alkaline, which is best for fish culture. Nevertheless, the pH was higher where clothes are washed and lower where cattle faeces is dumped.

### Transparency

An key element that regulates the energy relationship at various trophic levels is water transparency. During the study period, the transparency values varied between 28 cm and 36 cm. Summertime saw a decline and wintertime saw an increase. Due to a strong planktonic population throughout the summer, transparency was lower than it was during the wet season due to an increase in suspended particles from surface runoff. Due to the sedimentation of suspended debris, the winter season saw the highest levels of transparency (Chaurasia and Adoni, 1985; Sinha et al., 2002; Kadam et al., 2007; Shah and Pandit, 2012). Transparency is essential for the processing of nutrients and also reveals the water's production. The amount of plankton present affects the water's transparency. Because to the rainy season's poorer diluted plankton than the winter and summer, the water was more translucent during that time.

### Dissolve Oxygen

The solubility of many nutrients and the direct demands of many organisms both depend on oxygen content, which also impacts the periodicity of aquatic ecosystems (Wetzel, 1983). According to Jhingran (1982), given their high temperatures, tropical waters would have a low oxygen content. The findings of this investigation revealed that the highest peak value of dissolved oxygen, 9.5 ppm, was observed during the winter season and the lowest, 8.5 ppm, during the rainy season. The minimum dissolved oxygen has been noticed in summer may be due to extreme temperature which lowers the solubility of oxygen. The higher temperature also raises the breakdown rate and the decreases the oxygen Findings of the present investigation are similar to previous investigators (Prasad et al., 1985; Ramulu and Benarjee, 2013). (Prasad et al., 1985; Ramulu and Benarjee, 2013).

### Carbon dioxide

The normal water receive carbon dioxide from several sources i.e. (1) The atmosphere. (2) Respiration of plants and animals. (3) Bacterial breakdown of organic materials (4) Inflowing ground water. The pH and carbon dioxide are related; when carbon dioxide levels rise, pH falls (acidic). The CO<sub>2</sub> fluctuated from 16 to 20 ppm .High free CO<sub>2</sub> in was measured in summer season and minimum in the rainy season. The free carbon dioxide concentration depends on the respiration of organism (plants and animals) and photosynthesis rate. In case of higher photosynthesis more carbon dioxide will be utilized.

### Alkalinity

Carbonates and bicarbonates affect alkalinity. These salts got hydrolyzed in solution and created hydroxyl ion. Moreover, it serves as a gauge for water productivity (Jhingran, 1982; Hulyal and Kaliwal, 2011). Natural water bodies in tropics frequently show wide range of changes in their total alkalinity value depending upon the geography and season. The total alkalinity in the current study varied from 190 ppm to 224 ppm. It is gradually decreased from July to September and then increased in the month of October. Seasonally maximum value was observed during wet and lowest during the summer season. The addition of water and the dissolution of calcium carbonate ions in the water column were responsible for increases in total alkalinity throughout the rainy season (Padma and Periakali, 1999). The degradation of plants and other organism and organic waste might also be one of the reason for the increase in carbonate and bicarbonate thereby the alkalinity (Jain et al., 1997; Chaurasia and Pandey, 2007). (Jain et al., 1997; Chaurasia and Pandey, 2007).

### Hardness

Water hardness is caused by Ca<sup>++</sup> and Mg<sup>++</sup> salts, primarily in the form of carbonates and sulphates (Wadia, 1961). The total hardness of the water used in this study varied seasonally from 90 to 120 ppm, with the summer recording the highest value and the rainy season the lowest. Similar observations were obtained by other workers (Kumar, 1995; Naik and Purohit, 1996; Kaur et al., 2000; Nair, 2002). (Kumar, 1995; Naik and Purohit, 1996; Kaur et al., 2000; Nair, 2002). Hulyal and Kaliwal (2011) discovered that the value was higher in the summer and lower in the winter.

### Total Dissolve solid

Water is a universal solvent and have a vast number of salts dissolved in it which significantly regulate the physico-chemical properties. Total dissolved solids were at their highest point (172 ppm) during the rainy season and their lowest point (154 ppm) during the winter. The residential waste water, rubbish, sewage, and other substances that are added to the natural surface water body during rainy season may be the cause of the high TDS value.

### Conclusion

The analysis of the various parameters showed that, with the exception of the plankton concentration, all three ponds' physical, chemical, and biological properties fall within the range that is acceptable for fish culture. It may be due to overstocking or more creatures feeding on plankton. It can be advised that the pond's stocking be done based on the water's natural productivity or, if possible, supplemental feeding to increase production.

### Reference

- [1] Sahni K and Yadav S (2012) Seasonal Variations in Physico- Chemical Parameters of Bharawas Pond, Rewari, Haryana. *Asian J. Exp. Sci.* 26(1): 61-64.
- [2] Yadav P, Yadav VK, Yadav AK and Khare PK (2013) Physicochemical characteristics of a fresh water pond 184 Octa. *J. Biosci.* 1(2): 177-184.
- [3] APHA (1998) Standard Methods for the Examination of water and wastewater. American Public Health Association, Washington D. C., 1000p
- [4] Dwivedi BK and Pandey GC (2002) Physico-chemical factors and algal diversity of two ponds in Faizabad, India. *Poll.Res.* 21(3):361-370.
- [5] Singh RP and Mathur P (2005) Investigation of variations in physicochemical characteristics of

- a fresh water reservoir of Ajmer city, Rajasthan, Ind. J. Environ. Sci. 9: 57-61.
- [6] Wetzel RG (1975) Limnology, WB Saunders Company Pub. Philadelphia, London, Toronto 740. 65.
- [7] Kannan V and Job SV (1980) Diurnal depth wise and seasonal changes of physicochemical factors in Sathio reservoir. Hydrobiol. 70: 103-117.
- [8] Jhingran VG (1982) Fish and fisheries of India. 2nd Edn., Hindustan Publishing Corporation, India.
- [9] Kadam MS, Pampatwar DV and Mali RP (2007) Seasonal variations in different physicochemical characteristics in Mosoli reservoir of Parbhani district, Maharashtra. J. aquatic biol. 22(1): 110-112.
- [10] Sinha MP, Kumar R, Srivastava R, Mishra SK and Choudhuri AK (2002) Ecotaxonomy and biomonitoring of lake for conservation and management. Biotic Profile In: Ecology and Conservation of Lakes, Reservoirs and Rivers. Vol. II. Arvind Kumar (Eds) ABD Publication Jaipur, India. 248-289.
- [11] Saha LC and Pandit B (1985) Limnological variations in pond and Riverine ecosystem Proc. Nat. Symp., Pure and Appl. Limnology, (ed.) Adoni AD Bull. Bot. Soc. Sagar 32: 124-130.
- [12] Chourasia SK and Adoni AD (1985) Zooplankton dynamics in a shallow eutrophic lake. Proc. Nat. Symp. Pure Appl. Limnology Bot. Soc. Sagar, 32:30-39.
- [13] Prasad BN, Jaitly YC and Singh Y (1985) Periodicity and interrelationships of physicochemical factors in pond. Proc. Nat. Symp. Pure and Applied Limnology (ed Adoni AD) Bull. Bot. Soc. Sagar, 32: 1-11.
- [14] Ramulu NK and Benarjee G (2013) Physicochemical factors influenced plankton biodiversity and fish abundance- A case study of Andhra Pradesh. Int. J. Life Sc. Bt. & Pharm. Res. 2(2): 248-260.
- [15] Hulyal SB and Kaliwal BB (2011) Seasonal Variations in Physico- Chemical Characteristics of Almatti Reservoir of Bijapur district, Karnataka State. Int. J. Env. Prot. 1(1): 58-67.
- [16] Jain CK, Bhatia KKS and Vijay T (1997) Ground water quality in coastal region of Andhra Pradesh. Indian J. Environ. Health. 39 (3): 182-190.
- [17] Kaur H, Bath KS, Mandar G and Jerath N (2000) Physicochemical status of Kanjli wetland (Punjab-India), J. Environ. Pollut. 7(1): 39-42.
- [18] Kumar A (1995) Observation on the diel variations in abiotic and biotic components of the river Mayurrakshi (Santal Pargana). Bihar. Indian. J. Ecol. 22(1): 39-43.
- [19] Nair MS Rajendran (2002) Seasonal variations of physicochemical factors and its impact on the ecology of a village pond at Imala (Vidisha), J. Ecobiol 12(1): 21-27.
- [20] Kumar A (1995) Observation on the diel variations in abiotic and biotic components of the river Mayurrakshi (Santal Pargana). Bihar. Indian. J. Ecol. 22(1): 39-43.
- [21] Naik S and Purohit KM (1996) Physico-chemical analysis of some community ponds of Rourkela. I.J.E.P. 16(9): 679-684.