

## Physiochemical Analysis of Sewage Sludge in Taj Baj Khan Pokhara, Hajipur, Vaishali, Bihar

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**Annotation:** Physiochemical analysis of Taj Baj Khan Pokhara, situated South of Subhash Chowk, Hajipur, Vaishali, Bihar, India. Carried out from January 2024 to December 2024, during the analysis the limnological factors such as color, odor, temperature, acidity, electrical Conductivity, pH, sulphate, chloride, total hardness, total dissolved solid, DO, BOD, COD and alkalinity were taken into consideration and the data were recorded and analyzed.

In this study, the air temperature range is from 18°C to 33°C, whereas water temperature ranges from 17°C to 32.8°C. pH ranges from 8.4 in August to September. The lowest value of DO was observed in May (4.2 mg/l) and the highest value was observed in November (13.2 mg/l). Free carbon dioxide varies from 2.5 mg/l to 10.4 mg/l. Chloride content ranges from 71 mg/l to 164.4 mg/l. Alkalinity level ranges from 82 mg/l to 164.4 mg/l, whereas phosphate level was in between 0.42 mg/l and 0.84 mg/l. According to the above result, the selected pond is suitable for fish culture, but continuous monitoring of all the parameters is necessary.

**Keywords:** Limnological, Parameters, Monitoring, Physiochemical, Dissolve oxygen.

## Introduction

A major part of groundwater study is the water quality analysis, which is the study of physicochemical analysis to regulate or assess the water to determine whether it is acceptable for fish culture, irrigation, or any other household purposes. Water quality is determined by contrasting factors, which may be categorized as physical, chemical, biological, etc. All these factors affect water quality as well as the spread and reproduction of different aquatic organisms like fish, etc. Because all living organisms can tolerate an established range of these parameters. Major divergence from these ranges can seriously affect the body functions of aquatic organisms. For this, my objective focuses on the study of the limnological attribute of the freshwater pond required for fish culture.

The availability of good-quality water is an indispensable feature for preventing diseases and improving quality of life. Natural water contains different types of impurities that are introduced into aquatic systems in different ways, such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere, and several human activities, including mining, processing, and the use of metal-based materials.

## Materials and Methods

**Description of the site:** Name of the pond; Taj Baj Khan Pokhara, Hajipur, Vaishali. Color of water: Green; depth: 7-8 ft. Type of water body: Perennial pond water: Rainfall, domestic and surface runoff washing/cleaning, bathing. Management practices: Moderately clean; fish culture noticed. Vegetation types includes herbs, and shrubs and mango trees at the bank of the pond.

**Study period:** Samples were collected once a month from the pond between 8:30 am and 10 am from January 2024 to December 2024.

**Collection of samples:** samples were collected from the above-mentioned pond in two plastic bottles, each of one-liter size. The containers were properly washed with diluted hydrochloric acid and then rinsed with normal water, followed by distilled water, followed by sample water.

## Analysis of the sample:

Monthly samples were collected to analyze physio-chemical parameters of the site; a thermometer and a digital pH meter were used to note down the temperature and the pH of the pond water, respectively. For the rest of the analysis, water samples were carried to the laboratory. In the laboratory, DO was determined by Winkler's method. The titrimetric method was used to measure free CO.

## Result and discussion

**Temperature:** One of the most beneficial factors is temperature. In the case of limnological study, it is very crucial to study, as the growth and organization of plants and animals are influenced by this factor, also influenced by this factor. Dissolved oxygen level is also harshly affected by this factor. In this study, air temperature was found to be the highest is highest in June (36°C) and lowest in January (18°C). Water temperature in June (36.8°C) and lowest in January (16.1°C). Due to the smaller size of the pond, a quick response to atmospheric temperature changes was noticed.

**Water pH:** The negative exponential value of hydrogen ions in the water is pH, which is a measure of acidity or alkalinity. In this study, the pH values varied from 7.6 to 9.4. From these values, it may be deduced that the pond water is alkaline. The minimum pH was recorded in summer, and the maximum pH was recorded in winter.

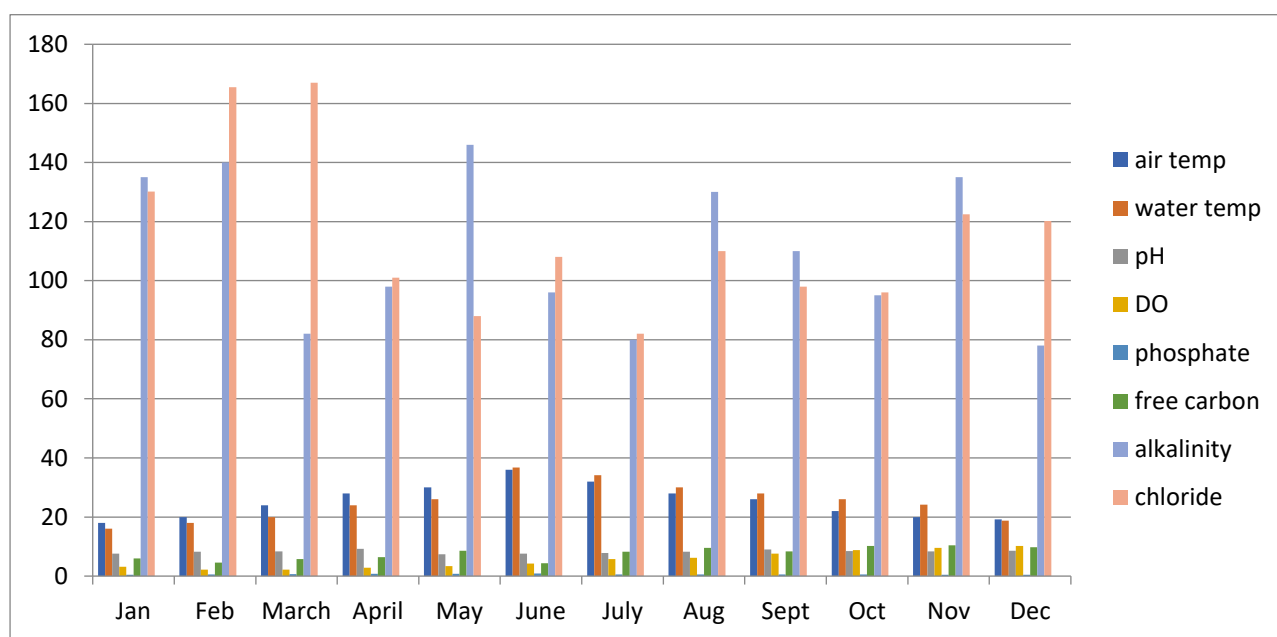
**DO (Dissolved oxygen):** The DO is a crucial factor. It was increasing in winter and decreasing during monsoon. This is due to low atmospheric temperature in winter (high level of dissolved oxygen) and high metabolic rate of organisms. In this study, it is found to be highest in December (10.2 mg/l) and lowest in May (3.4 mg/l). In low dissolved oxygen levels, organic matters started decreasing.

**Free Carbon Dioxide:** Free carbon dioxide in the pond is due to the seeping of inflowing groundwater, respiration of aquatic organisms, decomposition of aquatic organic matter, etc. Free CO<sub>2</sub> value was lowest in June (4.4 mg/l) in the summer season, and the value was highest in November (10.4 mg/l), i.e. in the winter season. They also noticed the high summer value of free carbon dioxide.

**Chloride content:** One of the most essential inorganic ions in water is chloride. This is found in almost all water bodies, as it is highly soluble. It is also regarded as a major display of sewage pollution. In my study, chloride is recorded to be highest in March in the summer season and lowest in July in the monsoon season.

**Table - Monthly variation in Physiochemical factors of Taj Baj Khan Pokhara**

Parameters	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sep 2024	Oct 2024	Nov 2024	Dec 2024
Air temp (°C)	18	20	24	28	30	36	32	28	26	22	20	19.2
Water temp (°C)	16.1	18	20	24	26	36.8	34.2	30	28	26	24.2	18.8
pH	7.6	8.2	8.4	9.2	7.4	7.6	7.8	8.3	9.0	8.5	8.4	8.6
Dissolve oxygen mg/l	3.2	2.24	2.2	2.8	3.4	4.2	5.8	6.2	7.6	8.8	9.6	10.2
Phosphate	0.4	0.58	0.62	0.80	0.74	0.86	0.54	0.60	0.54	0.60	0.44	0.45
Free carbon dioxide mg/l	6.0	4.6	5.8	6.4	8.6	4.4	8.2	9.6	8.4	10.2	10.4	9.8
Alkalinity mg/l	135	140	82	98	146	96	80	130	110	95	135	78
Chloride	130.2	165.5	167	101	88	108	82	110.0	98	96	122.5	120.2



**Figure– Monthly variation of different limnological factors.**

**Alkalinity:** The ability to endure changes in pH is alkalinity which is due to the presence of carbonates, phosphates, bicarbonates hydroxides, and other compounds in water.

Evaporation and decomposition of organic matter, denitrification, photosynthesis, etc are the main factors for increasing alkalinity whereas respiration, nitrification etc are the main factors for declining alkalinity. It is increasing at an alarming rate in May and decreasing in December in my study.

**Phosphate:** The phosphate content was lowest in January, 2024 (0.40mg/l) and highest in June,

2024 (0.86mg/l) with highest value in June in monsoon season and lowest value in January in the winter seasons.

### Conclusion

According to National Agriculture Extension Research the light green or green color of water is acceptable for fish culture. The standard blood pH level of fish is 7.421. Between 7.0 and 8.5, pH value is very good for fish life and biological productivity. More than 5 ppm DO is desired for good fish production. Long time contact with fish to very low oxygen level of 0.3 mg/l can cause death of fish. Fish can sustain higher carbon dioxide levels if they DO level is high. The optimum level of carbon dioxide for a fish pond is less than 10 mg/l. The ideal range of alkalinity is 75 to 200mg/l while it is 50 to 150mg/l as beneficial ranges. The acceptable phosphate level for fish culture is 0.06mg/l. Some researchers also suggested that 1.0ppm is optimum for production of plankton. Minimum level of chloride concentration is 60 mg/l. Higher chloride levels than 100mg/l can burn the edges of the gills. Depending on the limnological parameters selected, it may be concluded that the Taj Baj Pokhara is suitable for fish culture. But the results represent that more monitoring of all the parameters is necessary.

### References

1. Nighojkar Abhineet And Er.D.Dohare ,April(2014). Physico – Chemical Parameter for Testing of Present Water Quality of Khan River at Indore, India International research journal of Env.Sci. ISSN 2319-1414Vol.3(4), 74-81.
2. Hemlata Mahobe , August(2013).Study of Physico - Chemical Characteristics of Water Ponds of Rajnandgaon Town, Chhattisgarh, International Journal of Scientific & Engineering Research, Volume 4, Issue 8, 2229-5518.
3. Fletcher, P.L.M. Cook, M. Stewardson, B.F. Sanders, L.A. Levin, R.F. Ambrose, A. Deletic, R. Brown, S.C. Jiang, D. Rosso, W.J. Cooper, I. Marusic (2012).“Taking the waste out of Wastewater for human water security and ecosystem sustainability” Science, 337 (6095) , pp. 681–686.
4. Abir S. (2014). Seasonal Variations in Physico-Chemical Characteristics of Rudrasagar Wetland - A Ramsar Site, Tripura, North East, India. Research Journal of Chemical Sciences, 4(1), 31-40.
5. Pathak Neelam B. and Mankodi P.C. (2013). Hydrological status of Danteshwar pond, Vadodara, Gujarat, India. Int. Res. J. Environment sci.(2)1,38-43.
6. Ekubo A.A. and Abowei J.F.N. (2011). Review of some water quality management principles in culture fisheries. Research Journal of Applied Sciences, Engineering and Technology, 3(12), 1342-1357.
7. Mahobe H. and Mishra P. (2013). Study of PhysicoChemical Characteristics of Water Ponds of Rajnandgaon Town, Chhattisgarh. International Journal of Scientific & Engineering Research, 4(8), 738-748.
8. Santosh B. and Singh N.P. (2007). Guidelines for water quality management for fish culture in Tripura. ICAR Research complex for NEH Region, Tripura Centre , Publication No. 29.
9. Chen W, He B, Nover D, Lu H, Liu J, Sun W and Chen W (2019). Farm ponds in southern China: Challenges and solutions for conserving a neglected wetland ecosystem. Science of the Total Environment 659 : 1322-1334.