

Assessment of Some Physico-Chemical Parameters of Pond Water of Bareilly City

**AMIT KUMAR YADAV¹, MAHIRA NAJEEM¹, ANAMIKA AGARWAL¹, NISHTHA SETH¹,
GAURAV BHUSHAN^{1*}, SAMEER CHANDRA², JASPAL SINGH¹, RAVI KUMAR GANGWAR³
AND SANTOSH KUMAR SHARMA⁴**

¹Department of Environmental Science, Bareilly College, Bareilly, Uttar Pradesh, India, ²Department of Botany, School of Sciences, IFTM University, Moradabad, Uttar Pradesh, India, ³B.Tech Division, ICAR-Indian Veterinary Research Institute (Deemed University), Bareilly, Uttar Pradesh, India, ⁴KC India Test Laboratories, Ghaziabad, Uttar Pradesh, India

Article Chronicle: Received: 08-Jul-2025; Revised: 24-Sep-2025; Accepted: 02-Sep-2025

ABSTRACT This manuscript is related to the physico-chemical parameters of three ponds water, located in Bareilly city. Samples were collected from three stations (Akshar Vihar Pond, Choudhary Pond, and Delapeer Pond) in a routine manner. The physico-chemical parameters, such as pH, hardness, chloride, sulfate, total dissolved solids, alkalinity, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, electrical conductivity, and calcium were analyzed during this study.

KEY WORDS Akshar Vihar Pond, Choudhary Pond, Delapeer Pond, Water Quality

How to cite this article: Yadav, A.K, Najeem, M., Agarwal, A., Seth, N., Bhushan, G., Chandra, S., Singh, J., Gangwar, R.V., and Sharma, S.K. Assessment of Some Physico-Chemical Parameters of Pond Water of Bareilly City. *J. Env. Bio.Sci.* **39**, 193-196. (DocID: <https://connectjournals.com/03843.2025.39.193>)

INTRODUCTION

Our water resources are facing many types of serious threats, caused primarily by anthropogenic activities. Industrial wastewater and waste enter the river and polluting the water and making it unfit for drinking purposes and other domestic uses (Gupta and Shukla, 2006).

Today, people use pond water in many ways, and it sustains aquatic life. Fish, plants, insects, and microorganisms all depend entirely on the water's quality (Azmi *et al.*, 2015). A benchmark for water suitability for human consumption is indicated by this water quality, and the need for its sustainable management today is thereby reflected (Jain and Kumar, 2021). In recent years, physico-chemical characteristics of freshwater bodies have been examined in several studies (Dixit, 2015; Maya *et al.*, 2001).

Akshar Vihar Pond, Choudhary Pond, and Delapeer Pond are located in Bareilly city, Uttar Pradesh. In Bareilly City (U.P.), near the boundary between the Cantonment and Civil Lines areas, Akshar Vihar Pond is located. It is positioned at

latitude of 28° 20' 19" N and a longitude of 79° 25' 39" E, as indicated by its geographic coordinates. An area of about 1.8 km² is encompassed by the pond's roughly circular shape. The mean rainfall in the study area has been measured at 106.4 cm. The Choudhary Pond is located in Gulab Nagar, Bareilly. It is a natural water body, situated at 28.374626° N latitude and 79.410578° E longitude. Delapeer Pond is situated in the Delapeer (or Rajendra Nagar) area of Izzatnagar, Bareilly, Uttar Pradesh, positioned at approximately 28.3859° N, 79.4347° E. It lies about 1.31 km from Izzatnagar Junction railway station. The aim of the present study is exhibited the physical and chemical characteristics of these ponds water (Danurrachman *et al.*, 2023).

MATERIAL AND METHODS

Water samples were collected for physico-chemical analysis from three sampling stations, during May 2024–March 2025. One-liter polythene wide-mouthed bottles are used for collecting the samples. These are analyzed using standard methods for physico-chemical examination of

*Corresponding author: E-Mail: bhushanbcb25@gmail.com



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Journal Homepage: www.connectjournals.com/jeps

NAAS rating: 4.95

Indexed in: Web-Of-Science : Zoological Records

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water and wastewater vides (Devi and Antal, 2013). Samples were collected in a routine manner from all sampling sites, that is, the station No. I (Akshar Vihar Pond), the station No. II (Choudhary Pond), and the station No. III (Delapeer Pond).

Sampling site I: The first sample was collected from Akshar Vihar Pond. This sampling site is at the nearby the boundary between the Cantonment and Civil Lines.

Sampling site II: The second sample of Water was collected from the Choudhary Pond. This Sampling site is nearby the G R M School, Bareilly City, and the Water of this location. It is said that this location is too religious.

Sampling site III: The third sample of Water was collected from the Delapeer Pond. This Sampling site is nearby Delapeer, Bareilly City. The Water of this location is very harmful.

Dissolved oxygen (DO) and pH were measured on the sampling spot (Sharma and Kumar, 2022). pH was measured by a water analysis kit, DO by Winkler's method, total alkalinity by simple titration method, and total hardness by ethylenediamine tetraacetic acid (EDTA) titration method. The other physico-chemical parameter measured by standard procedures and methods (APHA, 2005; BIS, 2012).

RESULT AND DISCUSSION

Ponds play a crucial role to maintain the water table in any area. Therefore, physico-chemical parameters of the water body reveal the quality of water (Devi *et al.*, 2017). These ponds are three major ponds in Bareilly flowing through different parts. These include so many ponds in different parts of the district. There was a time when the water in these ponds was very pure and clean, but now the water is so polluted that if taken may speed up the death of a person. The water of the pond is so polluted that not to talk of drinking, it is unfit ever for swimming or taking bath. The analysis of physico-chemical parameters of these ponds is described as:

pH

The pH value indicates the nature of water (alkaline or acidic). Therefore, the pH range plays a very important role for supporting the life of aquatic organisms. The pH ranges from 7.9 to 8.5. The variation can be due to the exposure of river water to the atmosphere, biological and temperature changes. The pH value was increased in Delapeer Pond, moderate in Choudhary Pond, and neutral in Akshar Vihar Pond.

Hardness

A traditional measure of water hardness is its capacity to precipitate soap. The total hardness is defined as the combined concentration of calcium and magnesium, each expressed as calcium carbonate, in milligrams per liter (mg/L). In the present study, the observed values range from 180.6 ± 0.012 to 250.1 ± 0.017 mg/L in these ponds. The maximum hardness was observed in Delapeer Pond.

Alkalinity

The capacity of water to neutralize acids, and thus its buffering ability, is measured by water alkalinity. The

alkalinity was measured by titration using with a strong acid. In this present study, the value ranges from 55.1 ± 0.007 to 120 ± 0.013 mg/L, and observed high alkalinity in Delapeer Pond. The low alkalinity was observed in Choudhary and Akshar Vihar Pond.

Sulfate

Sulfates are widely found in everyday life. They are salts or esters of sulfuric acid, and many are produced from that acid (Kiran, 2010). It was observed during the study that, sulfates range was increased in Delapeer Pond, moderate in Choudhary, and minimum in Akshar Vihar Pond. The sulfate ranges vary between 35.5 ± 0.008 and 101.8 ± 0.015 mg/L.

Total Dissolved Solids (TDS)

A measurement of all inorganic and organic substances in water, present in molecular, ionized, or microgranular (colloidal sol) form, is provided by the TDS parameter. The TDS was observed in the range 101.2 ± 0.001 – 395.28 ± 0.008 mg/L. Therefore, the TDS range was maximum in Delapeer Pond, moderate in Choudhary Pond, and minimum in Akshar Vihar Pond.

Calcium

Calcium is also a significant parameter in natural water. The growth and population dynamics of freshwater flora and fauna are affected by calcium concentrations (Venkatesharaju *et al.*, 2010). It was observed that the maximum value up to 78.2 ± 0.004 mg/L in Delapeer Pond, approximately 60.0 ± 0.018 mg/L in Akshar Vihar Pond, and 64.5 ± 0.011 mg/L in Choudhary Pond.

Electrical Conductivity (EC)

EC was measured by a Siemens conductivity meter. If water has a high EC, it means the water is more polluted, and lower EC shows less polluted or clean water (Lazhar *et al.*, 2025). High EC was measured in Delapeer Pond, moderate in Choudhary Pond, and lower in Akshar Vihar Pond (Table 1).

Chloride

A salty taste is imparted to water by higher chloride content, making it objectionable for consumption. Chloride is also the most important indicator of pollution in water (Nath *et al.*, 2015). Mohr's method is used to detect the chloride level in water. The estimated values of chloride were measured maximum in Delapeer Pond, minimum in Choudhary and Ashoka Vihar Pond. The chloride levels were in range between 106.3 ± 0.007 and 226.92 ± 0.008 mg/L.

DO

DO is the most significant chemical parameter to monitor water pollution level in water bodies (Islam and choudhary, 2013). In liquid wastes, whether biological changes are brought about by aerobic or anaerobic organisms is determined by the DO level. The physical and biological processes prevailing in the water are thus reflected by this factor. DO is inversely proportional to the temperature (Kamal

Table 1. Physico-Chemical analysis of pond water in bareilly city (U.P.)

S.No.	Sites	Site I	Site II	Site III
	Parameters	Akshar Vihar pond	Choudhary pond	Delapeer pond
1.	pH	7.9±0.004	7.61±0.005	8.5±0.003
2.	Hardness (mg/L)	180.6±0.012	192.1±0.014	250.1±0.017
3.	Alkalinity (mg/L)	55.1±0.007	88.5±0.016	120±0.013
4.	Sulphate (mg/L)	35.5±0.008	44.1±0.021	101.8±0.015
5.	T D S (mg/L)	101.2±0.001	255.02±0.006	395.28±0.008
6.	Calcium (mg/L)	60.0±0.018	64.5±0.011	78.2±0.004
7.	E.C (µS/cm)	1220±0.015	9533±0.008	16225±0.021
8.	Chloride (mg/L)	106.3±0.007	163.12±0.031	226.92±0.008
9.	DO (mg/L)	8.0±0.005	7.1±0.012	4.3±0.016
10.	BOD (mg/L)	6.1±0.013	7.2±0.008	9.0±0.022
11.	COD (mg/L)	8.4±0.009	14.1±0.013	20.1±0.015

et al., 2007). The Winkler Method with Azide Modification was used to determine the DO. The maximum DO was analyzed in Akshar Pond, moderate in Choudhary Pond, and minimum in Delapeer Pond.

Biochemical Oxygen Demand (BOD)

BOD is also referred to as Biological Oxygen Demand (Ouballouk *et al.*, 2025). BOD is the amount of oxygen required by microorganisms, such as bacteria, to break down the organic waste in water bodies (Kiran, 2010). The respirometric method is used to determine the BOD. The high BOD level indicates more pollution in the water (Mohammad *et al.*, 2015). The BOD values were measured to be in the range of 6.1 ± 0.013 – 9.0 ± 0.022 mg/L. The maximum BOD level is found in Delapeer Pond, moderate in Choudhary Pond, and minimum in Akshar Vihar Pond.

Chemical Oxygen Demand (COD)

Water quality is also measured by the COD, which reflects the amount of chemicals present that require oxygen for oxidation (Nagaraju *et al.*, 2024). The closed reflux (titrimetric and colorimetric) method using the COD digester was used during this study. The estimated COD values were measured as high in Delapeer Pond, moderate in Choudhary Pond, and lower in Akshar Vihar Pond.

CONCLUSION

The role of ponds in the ecosystem is very important because it helps to maintain the groundwater level (Vyas and Nama, 1991). The present study is observed that Delapeer Pond is more polluted as compare to Choudhary Pond and Akshar Vihar Pond. The main reason behind the polluted pond is human activities (Patil and Tijare, 2001). Choudhary Pond, Akshar Vihar Pond, and Delapeer Pond are small water bodies, but more important ponds in their local areas. They help in conserving rainwater, support aquatic life. Ponds have suffered from many problems, such as Pollution, garbage dumping, and reduced water levels. This has happened mostly because of human neglect and lack of care. To bring back their natural beauty and usefulness, regular cleaning, better waste control,

and public involvement are needed. With proper management and support, these ponds can once again become clean and healthy.

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