
COMPARISONS OF PHYSICOCHEMICAL AND BIOLOGICAL PROPERTIES OF HIRVA TALAV LAKE IN RAMTEK DISTRICT OF NAGPUR AMONG DIFFERENT SEASONS

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Abstract

The earth's surface is 51 billion square kilometres, of which 36.1 billion are covered in water. We get our water from lakes, rivers, tanks, and snow-covered hills. The objective is comparisons of Physicochemical and biological properties of Hirva Talav Lake in Ramtek district of Nagpur among different seasons. Some of the variables to take into account are temperature, conductivity, water pH, dissolved oxygen, free CO₂ in water, alkalinity, hardness, conductivity, total dissolved material, BOD, COD, plankton, and E. coli. For each of these requirements, five litres of water will be sampled from three different lake locations. Between 2018 and 2020, samples will be taken twice (once per year) during the three seasons of summer, rainy, and winter. One Way ANOVA is carried out using SPSS 2019 as a comparison. The results showed that the water temperature varied significantly ($p < 0.001$) throughout the year, depending on whether it was winter, summer, or wet. Additionally, there are ($p < 0.001$) substantial changes between the winter, summer, and rainy seasons in terms of water pH, dissolved oxygen, free CO₂ in water, alkalinity, hardness, conductivity, total dissolved material, BOD, COD, plankton, and E. coli. As can be seen, the water quality varies with the seasons. Thus, education, right understanding, planning, and management of environmental resources are essential to stop environmental degradation of these surface water resources (lakes).

Keywords: Physicochemical, Biological properties, Hirva Talav Lake, Seasonal variation.

Introduction

"A beautiful item is a gift for all time." This idiom conjures up anything lovely in nature, but it especially applies to sights as captivating as a body of clear, clean water. The earth's surface area is 51 billion square kilometers, of which 36.1 billion are covered by water. We also receive water from lakes, rivers, tanks, and snow-covered hills. The various layers of the earth contain about 15 crore cubic kilometers of water. One of the basic essentials of life is water. A person can go without food for a few days, but they can't go without water for very long. The human body is made up of 70% water. Water is present in 18% of blood, 75% of cells, and 22% of bones, respectively. This demonstrates just how reliant on water we are. It is well understood how important freshwater ecosystems are to human habitation. For the health of both people and the environment, water is a priceless natural resource. Every day,



humans consume 1.89 litres for drinking, yet the world's communities are becoming increasingly concerned about the quality of the world's drinking water. Despite the fact that our planet has roughly 1500 million cubic kilometres of fresh water, most of it is useless to us because it contains a greater volume of salt. Our planet has an estimated fresh water supply of 84.4 million cubic kilometres, but as the global population grows and the standard of living rises, the range of human activities and industrialization broadens, so does the demand for high-quality water, even as the pollution caused by human activities rises. According to Samrat et al. (2012), In order to assess the lake's ability like a freshwater and fish ponds, cyclical variations in aquatic systems (Physiochemical and Ecological) of a rain-fed Kagzipura Water, Kagzipura Jharkhand (M.S.), were evaluated. A variety of indices, notably temp, pH, DO, dissolved solids, sulphur, and sulfate, have been studied throughout the time of a year. Numerous 1t and biological data were measured, and study sheds information on how to regulate these high-level lake parameters to ensure that they are at a level suitable for freshwater fish production. According to Waware et al. (2020), Nawargaon Lake is home to a wide variety of aquatic species. The main freshwater body in Yavatmal District of Maharashtra is the Nawargaon Lake, which is part of Maregaon Tahsil. Today's lakes are being damaged by anthropogenic and natural activity, which lower the water quality. Because of the growing human population, industrialization, fertiliser use, and other human-made activities, water is heavily contaminated with many dangerous chemicals. It is essential to regularly assess the quality of drinking water.

According to Shilpa et al. (2011), one of the main concerns for environmentalists is the pollution of water bodies. Water samples from three distinct lakes on the campus of Shivaji University in Kolhapur were taken for the current study. warmth, silt, biochemical oxygen demand, free nitrogen oxide, calcium alkalinity, inorganic salts, alkali, phosphorus, ammonia, and Ncp variations over the course of a month were examined. All parameters, with the exception of BOD, COD, and phosphates, were within the permitted ranges. The Rajaram Lake on the Shivaji University campus has greater anthropogenic contamination than the other two lakes. Choudhary et al. (2014) proposed that the two rural pools of water in Achieving sufficient, Bihar, only with natural variation in numerous important physiochemical indices and biology studies, using selected traditional classical approaches with an aim to investigate the existing condition for its better use. The reasons.it fell in within limit that would be appropriate for fish production, and the filling should have been handled in line with the output of the environment, as per the evidence gathered during several times (july, winter, et monsoon). Pradeep and Rajeev (2016) proposed that the physico-chemical state of Vishnu Sagar in Ujjain, Madhya Pradesh, India. Numerous manmade causes have an impact on the pond's biological balance. In the current study, total alkaline, TDS, total roughness, total salty, ionic strength, DO and nitrate were among the water quality indicators examined. According to Worako (2016), the lake's water quality is crucial for the neighborhood's proper and secure use. According to Singh et al. (2011), water quality degradation is less severe during the rainy season than it is in the summer. During the summer, free CO₂ levels were above the maximum limit while DO levels were below the lowest allowable limit. The Thoubal River saw higher values of the examined parameters

during the wet season than the Rivers in Rangoon, and Nagaland. The bulk of the Assam River device's microbiological properties were found to be below the WHO groundwater criteria, suggesting that it would have been appropriate that can be used in homes. Thus, in this article, the aim is comparisons of Physicochemical and biological properties of Hirva Talav Lake in Ramtek district of Nagpur among different seasons.

Method

Methodology is a logical as well as part of the study to guide scientific investigation. It helps may be understood as a science of study how research is done to organize the scattered views of different persons, information and steps required for fulfillment of the objectives of a study. Methodology reveals the entire process that will fully. An appropriate and systematic process should be followed for the completion of the study success. Methodology is always expected in any research work. It prevents the encroachment and haphazardness. The study place is Hirva Talva Lake (20°51'14"N and 79°19'46"E) located in Ramtek, Nagpur, Maharashtra, India. The study required a total of three visits different season i.e., summer, rainy and winter seasons of two year (2019 and 2020). The parameters like temperature and dissolved oxygen, conductivity, total nitrogen, total phosphorous, turbidity, hardness, alkalinity, acidity, dissolved oxygen, chemical oxygen demand, biological oxygen demand, pH values and the concentration of viable microorganisms. For all these parameters sample will be collected (5 litre water) from 3 different sites of pond which were designated as A, B and C in Figure 1. Samples will be collected during 3 seasons summer, rainy and winter 2 times (one time per year) between 2018 to 2020. For comparison, One Way ANOVA is performed through SPSS, 2019 version.



Figure 1: Different sites of Hirva Talva Lake located in Ramtek, Nagpur, Maharashtra, India.

Result and Discussion

Generally speaking, the temperature values were high in the summer and low in the rainy season, almost reflecting the ambient temperature. Temperature variations in the air and water are caused by the impact of the season, location, and collecting time. The amount of suspended organic and inorganic particle matter in a body of water directly relates to transparency. Plankton growth, wind speed, rainfall, the nature of the water body, and the current weather are additional factors that influence a body of water's transparency. The table 1 suggested that water temperature, showed significant ($p < 0.001$) differences between winter, summer and rainy season. Similarly, water pH, dissolved oxygen, free CO₂ in water, alkalinity, hardness, conductivity, total dissolved substance, BOD, COD, plankton and E. coli also have ($p < 0.001$) significant differences between winter, summer and rainy season.

Table 1: One way ANOVA, for different physicochemical and biological properties of Hirva Talav Pond in Ramtek district of Nagpur among different seasons.

| Properties | Source of Variation | SS | df | MS | F | P-value |
|-------------------------------|---------------------|---------|----|---------|----------|---------|
| Water Temperature | Between Groups | 23.17 | 2 | 11.585 | 121.9474 | <0.001 |
| | Within Groups | 0.285 | 3 | 0.095 | | |
| | Total | 23.455 | 5 | | | |
| Water pH | Between Groups | 6068374 | 3 | 2022791 | 16015767 | <<0.001 |
| | Within Groups | 0.5052 | 4 | 0.1263 | | |
| | Total | 6068375 | 7 | | | |
| Dissolved Oxygen | Between Groups | 6061679 | 3 | 2020560 | 15998097 | <<0.001 |
| | Within Groups | 0.5052 | 4 | 0.1263 | | |
| | Total | 6061679 | 7 | | | |
| Free CO ₂ in water | Between Groups | 6008919 | 3 | 2002973 | 15557071 | <<0.001 |
| | Within Groups | 0.515 | 4 | 0.12875 | | |
| | Total | 6008919 | 7 | | | |
| Alkalinity | Between Groups | 4942250 | 3 | 1647417 | 3294833 | <<0.001 |
| | Within Groups | 2 | 4 | 0.5 | | |
| | Total | 4942252 | 7 | | | |

| | | | | | | |
|-----------------------|----------------|---------|---|----------|----------|---------|
| Hardness | Between Groups | 5505189 | 3 | 1835063 | 7161222 | <<0.001 |
| | Within Groups | 1.025 | 4 | 0.25625 | | |
| | Total | 5505190 | 7 | | | |
| Conductivity | Between Groups | 6101647 | 3 | 2033882 | 16267805 | <<0.001 |
| | Within Groups | 0.5001 | 4 | 0.125025 | | |
| | Total | 6101648 | 7 | | | |
| Total dissolved solid | Between Groups | 5165757 | 3 | 1721919 | 10596425 | <<0.001 |
| | Within Groups | 0.65 | 4 | 0.1625 | | |
| | Total | 5165758 | 7 | | | |
| BOD | Between Groups | 6103029 | 3 | 2034343 | 16269863 | <<0.001 |
| | Within Groups | 0.50015 | 4 | 0.125038 | | |
| | Total | 6103030 | 7 | | | |
| Plankton | Between Groups | 6115884 | 3 | 2038628 | 16307394 | <<0.001 |
| | Within Groups | 0.50005 | 4 | 0.125013 | | |
| | Total | 6115885 | 7 | | | |
| E. coli | Between Groups | 1650439 | 3 | 550146.5 | 1599.844 | <<0.001 |
| | Within Groups | 1375.5 | 4 | 343.875 | | |
| | Total | 1651815 | 7 | | | |
| COD | Between Groups | 5557090 | 3 | 1852363 | 194985.6 | <<0.001 |
| | Within Groups | 38 | 4 | 9.5 | | |
| | Total | 5557128 | 7 | | | |

Conclusion

Evaluation of water quality is crucial for determining contamination levels. Safe water that is suitable for human consumption is known as potable or drinking water. One of the main

sources of the bacteria that cause health issues is water. As seen, the seasons have an impact on the quality of the water. Thus, in order to stop environmental degradation of these surface water resources, knowledge, correct understanding, planning, and management of environmental resources are crucial (lakes).

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