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PHYSICOCHEMICAL AND BIOLOGICAL PROPERTIES OF HIRVA TALAV LAKE IN RAMTEK DISTRICT OF NAGPUR

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Abstract

"A lovely thing is a gift that lasts forever." This adage invokes images of anything attractive in nature, but it is especially appropriate for views as alluring as a body of clean, clear water. 51 billion square kilometres make up the surface of the globe, of which 36.1 billion are covered in water. Lakes, rivers, tanks, and snow-covered hills all provide us with water. The aim of this study is to find the physicochemical and biological status of Nagpur's HirvaTalavLake Ramtek district (Maharashtra). temperature, water pH, dissolved oxygen, free CO2 in water, alkalinity, hardness, conductivity, total dissolved material, BOD, COD, plankton, and E. coliare some of the characteristics to consider. Five litres of water will be sampled from three distinct lake locations for each of these criteria. In the three seasons of summer, rainy, and winter, samples will be taken twice (once each year) between 2018 and 2020. Results indicated that the summer season is when the pH and water temperature are at their highest. In the wet and winter seasons, levels of dissolved oxygen, free CO2, and alkalinity are high. BOD and dissolved solids content are both high during the rainy season, whereas COD is high throughout the summer. In the winter, the lake's coliform levels were low, but during the summer and rainy season, they were rather high. Winter E. coli numbers in Lake were low, whereas summer and rainy season counts were rather high. Hirva Lake in the Nagpur region should not be used for residential trash disposal. Consistent efforts must be made to increase public understanding of the importance of safe drinking water.

Keywords: Physicochemical, Biological properties, HirvaTalav Lake.

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, andstudy 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 and ammonia,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 to find physicochemical and biological status of HirvaTalav LakeRamtek dist. Nagpur (Maharashtra).

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 HirvaTalvaLake(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.

Figure 1: Different sites of HirvaTalvaLake located in Ramtek, Nagpur, Maharashtra, India.

Result and Discussion

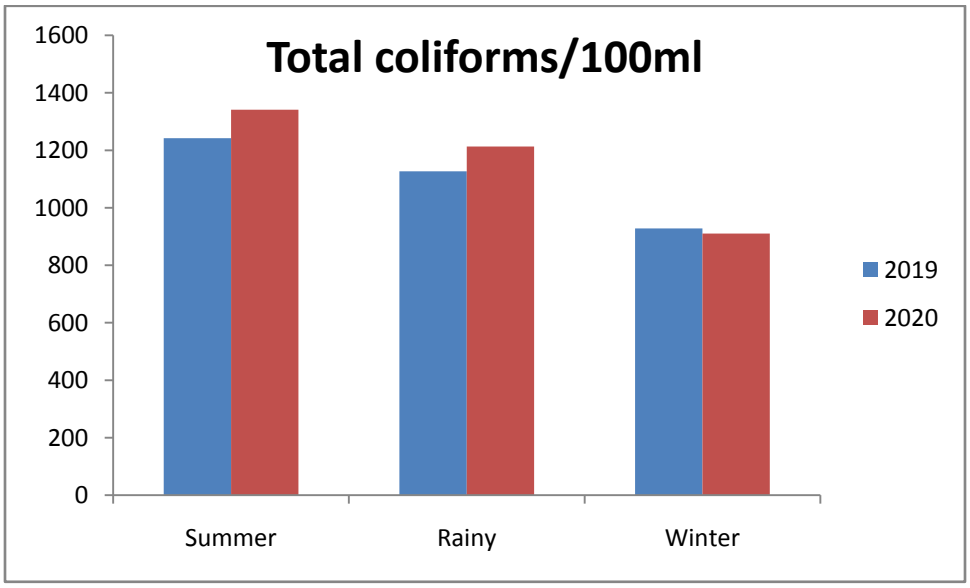
Table 1 representing the physicochemical and biological status of HirvaTalav Lake and suggesting that the water temperature, pH is high during summer season of year. Dissolved oxygen, free CO_2 and Alkalinity is high in rainy and winter season. Dissolved solids content and BOD are high in rainy season while COD is high in summer season.

Table 1: Representing the physicochemical and biological status of HirvaTalav Lake.

Property	Year	Summer	Rainy	Winter
Water Temperature (degree Celsius)	2019	27.4±0.8	24.4±1.5	22.95±1.5
	2020	28.1±0.6	24.6±1.2	23.15±1.2
Water pH	2019	8.5±0.4	8.0±0.37	7.85±0.25
	2020	8.6±0.5	8.0±0.35	7.87±0.3

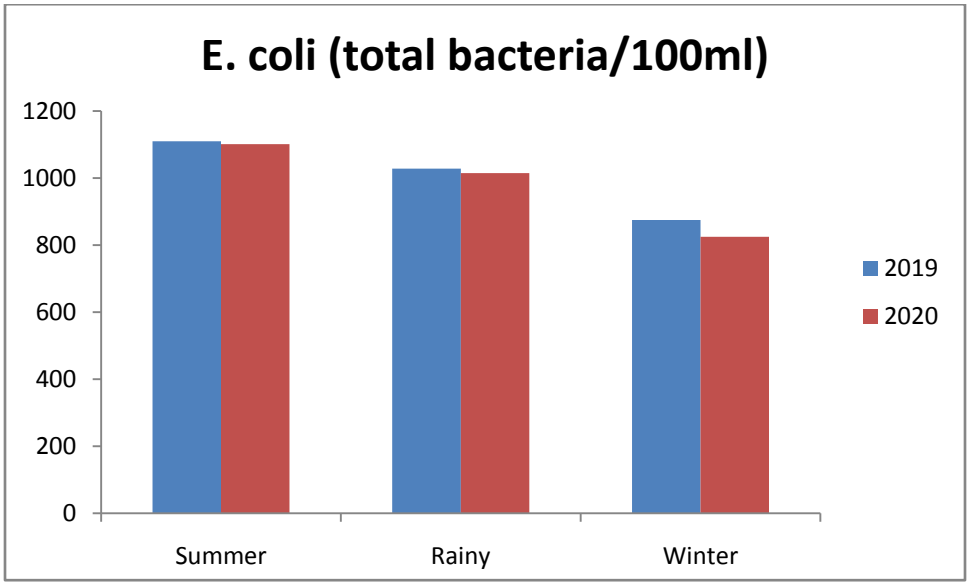
Dissolved Oxygen (ppm)	2019	8.7±0.4	9.6±0	9.5±0.2
	2020	8.6±0.5	9.6±0.35	9.48±0.3
Free CO2 (ppm)	2019	16±2.0	18±3	20±3
	2020	16.1 ±1.9	18.1± 2.8	19.9 ±3.1
Alkalinity (ppm)	2019	190±5	220±3	202±3
	2020	191±4.8	221±2	203±3.1
Hardness (ppm)	2019	118	90	103
	2020	119	90.2	103.1
Dissolved solids (ppm)	2019	165	172	154
	2020	165.1	172.2	154.5
BOD (ppm)	2019	2.18±0.4	2.82±0.5	2.21±0.6
	2020	2.19±0.4	2.81±0.5	2.20±0.4
COD (mg/l)	2019	103	95	80
	2020	110	96	85

Figure 2: Total coliform (total coliforms/100ml) variations of Hirva Lake water.



The total coliform counts in water bodies were conducted to determine the amount of coliforms present in water samples as a measure of the degree of biological contamination. Water bodies' total coliform levels are a crucial indicator of potential sewage contamination. Total coliform counts during the summer months increased considerably during the rainy season, research has shown. At all Lake sites during the summer, higher total colony counts were noted. Even though the facility has a biological treatment plant, the higher total coliform and count results most likely result from occasionally discharging untreated wastewater into Lake. When coliform organisms are present, it is assumed that pathogenic organisms may also be present, and when they are absent, it is assumed that the water is free of organisms that cause disease. The results of the current study show that overall coliform levels in Lake were low in the winter and quite high in the summer and rainy season.

Figure 3: E. coli (total bacteria/100ml) variations of Hirva Lake water.



The total E. coli count in a body of water is a crucial indicator of potential sewage contamination. Total coliform counts during the summer months increased considerably during the rainy season, research has shown. At all Lake sites during the summer, higher total colony counts were noted. Though the facility has a biological treatment plant, the higher overall E. coli levels and counts most likely result from occasionally discharging untreated wastewater into Lake. When E. coli is present, it is assumed that other harmful organisms may also be present, and when it is absent, it is assumed that the water is free of organisms that cause sickness. The results of the current study show that total E. coli counts in Lake were low in the winter and quite high in the summer and rainy season.

Conclusion

It is advised against disposing of household rubbish in the Hirva Lake in the Nagpur area. It is necessary to make consistent efforts to raise public awareness of the value of clean drinking water.

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