EFFECTS OF VARIATIONS OF PHYSICAL CHARACTERISTICS OF LAKEWATER COLLECTED FROM RETTERI COMPARED WITH STANDARD DRINKING WATER

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Abstract

Aim: The main aim of the research is about the effects of variations of physical characteristics of water collected from a lake in Retteri. The water from the lake is characterized by extreme quantities of Total Dissolved Solids(TDS), pH, color, Turbidity and Suspended Solids.

Materials and Methods: The pH was measured by pH meter. The Turbidity of the lake water sample was measured using a digital turbidity meter. The suspended solids was measured by using WHATMAN filter paper, the total dissolved solids was measured using TDS meter and the color of lake water was using integral spectrophotometer

Results :The samples were analyzed and compared with the Indian standards of effluent discharge. The raw wastewater consists of pH of (6.4-6.7). total dissolved solids range from(883-840)mg/I, Turbidity ranges from(12.2-12.7) NTU, the color of lake water was (18- 21) Hz and suspended solids of (1500-1620)mg/I respectively.

Conclusion: After the test it shows the pH and color of the Total Dissolved Solids. Suspended Solids, Turbidity were not in the permissible limits Standard Drinking Water.

Keywords: Lake Water, Standard drinking water, Physical parameters,Temperature, Permissible Limits, Pollution Measures.

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1. Introduction

Water pollution is one of the most serious problems of modern civilization. The consumption of water has been doubling every twenty years but the reduction of this period is expected if today's trends continue in water. Lakes are important for various reasons, like regulating the flow of river water, storage of water during the dry seasons, to maintain the ecosystem, and also the generation of hydroelectric power. The different types of lakes in India are freshwater lakes and salt water lakes. Temperature, light, and wind are three of the main factors that affect the physical characteristics of a lake. Temperature and light vary from lake to lake. Depth, plant growth, dissolved materials, time of day, season, and latitude can all affect light's ability to pass through the lake's water. The application of the lake water develops hydroelectric power, providing water supply for the purpose of irrigation.Industries and factories use river and lake water for their functioning.

There were numerous papers published over the past five years. The most cited articles are Application of principle component analysis to the distributions of heavy metals in the water of lakes and reservoirs in yunnan Province monitoring and assessment of heavy metal contamination in surface water and sediment of the old Brahmaputra River, Bangladesh.Heavy metal pollution in surface water and sediment: a preliminary assessment of an urban river in a developing country Lake and River Restoration: Method, Evaluation and Management. The best study is Evaluation of surface water quality by using GIS and a heavy metal pollution index model in a coal mining area, India.

Our institution is passionate about high quality evidence based research and has excelled in various domains (Vickram et al. 2022; Bharathiraja et al. 2022; Kale et al. 2022; Sumathy et al. 2022; Thanigaivel et al. 2022; Ram et al. 2022; Jothi et al. 2022; Anupong et al. 2022; Yaashikaa, Keerthana Devi, and Senthil Kumar 2022; Palanisamy et al. 2022). It is very essential and important to test the water before it is used for drinking and domestic purposes. Selection of parameters for testing of water solely depends upon for what purpose We are going to use that water and to what extent we need its quality and purity. Some physical test should be performed for testing of its physical appearance such as temperature, color, odor, pH, turbidity, TDS etc, while
chemical tests should be perform for its BOD, COD, dissolved oxygen, alkalinity, hardness and other characteristics. The aim of my project is to analyze the physical characteristics of the lake water.

2. Materials and Methods

The samples collected from the lake water were brought for the physical analysis in the laboratory. This study was done in the Department of Civil engineering Saveetha School of Engineering. Lake water samples were collected from Retteri Lake.The samples were collected during september 2021 to october 2021 respectively. Collected sample was categorized to be tested in 5 parameters namely color, total dissolved solids, turbidity, pH and suspended solids. .The pH was measured by pH meter. The color concentration was determined using an integral spectrophotometer. Suspended solids- WHATMAN filter paper. The turbidity measured by Digital turbidity meter . Each parameter was tested four times and compared with Standard drinking water.

Statistical Analysis

Results of experimentation were analyzed using SPSS, version 21 software. Independent samples t-test was done .

3. Results

Comparing the physical parameters of lake water with disposable standards it shows that pH,TDS, SS, Turbidity , color is it permissible limit compared with standard drinking water

Simple Bar graph for Lake water quality of water is compared with Standard drinking water is shown in Fig.1. The mean quality of water of Lake water of pH, color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 and Standard drinking water of pH, color, TDS, TSS and Turbidity is 7, 25, 2000, 100 and 25.Variable results with its standard deviation ranging from 80 lower to 90 higher Lake water where Standard drinking water standard deviation ranging from 90 lower to 100 higher. There is a significant difference between Lake water and Standard drinking water ($p<0.05$ Independent sample test). X-axis: Standard drinking water quality of water vs Lake water Y-axis: Median of quality of water, for identification of keywords ± 1 SD with 95 % CI.

Comparison of Lake water and Standard drinking water for analyzing the quality of water. The quality of water of Lake water of pH, color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 Table 1 and Standard drinking water of pH, color, TDS, TSS and Turbidity is 7, 25,2000, 100 and 25.

The statistical calculation such as Median, standard deviation and standard error Median for Lake water and Standard drinking water. Table 2 The quality of water parameter used in the t-test. The mean quality of water of Lake water of pH, color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 and Standard drinking water of pH, color, TDS, TSS

and Turbidity is 7, 25,2000, 100 and 25. The Standard Deviation of Lake water is 1.82833 and Standard drinking water is 0.82922. The Standard Error Median of Lake water is 2.28334 and Standard drinking water is 0.92827.

The statistical calculations for independent samples test between Lake water and Standard drinking water. **Table 3** The quality of water is 0.026. Independent samples T-test is applied for comparison of Lake Water and Standard drinking water with the confidence interval as 95% and level of significance as 0.12323. This independent sample test consists of significance as 0.001, significance (2-tailed), Median difference, standard error difference, and lower and upper interval difference.

4. Discussion

The average pH value at Site 1 was 6.8 whereas at Site 2 and 3 it was 7.0 and 7.1 respectively. The lowest pH values were recorded during monsoon and post-monsoon season, which implies the influence of run-off water entering into the water bodies. The pH was slightly alkaline during summer and pre-monsoon which may be due to dumping of garbage and inflow of sewage water. The desirable limit of pH recommended by Drinking Water Specification Indian Standard - IS 10500: 1991 is 6.5-8.5. The temperature of water varied between 22°C and 36.4°C at Site 1 with a mean of 32°C. At site 2 it ranged between 22°C and 34°C (mean-31°C) and at Site 3 between 26.3°C and 35.4°C with a mean of 31.1°C. In all the three sites a high temperature was recorded during summer and lower temperature during post-monsoon, which is a normal feature in fresh water bodies.

In the face of a continuously growing population and the lack of proportionate sanitation infrastructure, authorities in India face a mammoth task to safeguard the environment and citizens' public health. This paper has explored recent developments in Indian wastewater discharge and reuse standards alongside the approaches adopted elsewhere. While the contamination of Indian rivers is reported to be increasing and requires action, the implementation of a single set of stringent standards without a detailed development plan can risk to slow down the overall sectoral development through heavy investment and by this result in higher pollution levels and public health concerns for unserved regions.

Lake water treatment for water pollutants is becoming a trend, and it is drastically improving in this advanced time because of entirely awful states of water and freshwater demand in the entire universe. A significant requirement for progressive innovation for water treatment draws near, explicitly to affirm good quality drinking water and to eliminate micro and macro contaminants and toxins. Lake water has manifested incredible accomplishments for water decontamination, controlling difficulties and making some progress for the future. Approaches of lake water, and so on are extremely productive, require less time, are eco-friendly techniques, and require less energy, however, every one of these techniques is inexpensive, and they are not utilized at this point for the industrial purpose of wastewater purification at an enormous scope. Due to the high reaction rate, nanomaterials show high efficiency. In any case, there are a few shortcomings that should be avoided. There are no digital, computerized monitoring methods that offer predictable measurement on real-life(Myster 2018) facts regarding nanoparticle prevalence, which are available in limited quantities in water. Besides, to decrease hazards to health, international research universities and research institutes ought to plan legitimate terms and conditions to solve these circumstances.

The proportion of freshwater on earth's surface is only 2.5% of which only 1% is accessible for use. In this context, lakes are one of the most important water resources and have been used as a source of water supply for human consumption and in general accounts for about 0.3% of the total surface water body sources. As such, the conditions of lakes have been in constant deterioration due to increased anthropogenic activities surrounding them. In principle, the quality of lake water (or other surface sources) is evaluated using various physico-chemical and biological parameters selected on the Designated Best Use (DBU) of the water body (lake) for various purposes.

5. Conclusion

The proposed model exhibits the Lake water and Standard drinking water, in which the Standard drinking water has the highest physical characteristics in water. The quality of water of Lake water of pH, Color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 and Standard drinking water of pH, Color, TDS, TSS and Turbidity is 7, 25,2000, 100 and 25.

Declarations:

Conflict of interests

No conflict of interest in this manuscript. The proposed model exhibits the Lake water and Standard drinking water, in which the Standard drinking water has the highest physical characteristics in water. The quality of water of Lake water of pH, color, TDS, TSS and Turbidity is 6.5, 16, 923, 33 and 17.43 and Standard drinking

water of pH, color, TDS, TSS and Turbidity is 7, 25,2000, 100 and 25.

Authors Contributions

Author RR was involved in image collection, algorithm development, image analysis, manuscript writing. Author MT was involved in conceptualization, data validation, and critical review of manuscript.

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6. References

Anupong, Wongchai, Lin Yi-Chia, Mukta Jagdish, Ravi Kumar, P. D. Selvam, R. Saravanakumar, and Dharmesh Dhabliya. 2022. "Hybrid Distributed Energy Sources Providing Climate Security to the Agriculture Environment and Enhancing the Yield." *Sustainable Energy Technologies and Assessments*. https://doi.org/10.1016/j.seta.2022.102142.

Bharathiraja, B., J. Jayamuthunagai, R. Sreejith, J. Iyyappan, and R. Praveenkumar. 2022. "Techno Economic Analysis of Malic Acid Production Using Crude Glycerol Derived from Waste Cooking Oil." *Bioresource Technology* 351 (May): 126956.

Jothi, K. Jeeva, K. Jeeva Jothi, S. Balachandran, K. Mohanraj, N. Prakash, A. Subhasri, P. Santhana Gopala Krishnan, and K. Palanivelu. 2022. "Fabrications of Hybrid Polyurethane-Pd Doped ZrO2 Smart Carriers for Self-Healing High Corrosion Protective Coatings." *Environmental Research*. https://doi.org/10.1016/j.envres.2022.113095.

Kale, Vaibhav Namdev, J. Rajesh, T. Maiyalagan, Chang Woo Lee, and R. M. Gnanamuthu. 2022. "Fabrication of Ni–Mg–Ag Alloy Electrodeposited Material on the Aluminium Surface Using Anodizing Technique and Their Enhanced Corrosion Resistance for Engineering Application." *Materials Chemistry and Physics*. https://doi.org/10.1016/j.matchemphys.2022.125900.

Myster, Randall W. 2018. *Igapó (Black-Water Flooded Forests) of the Amazon Basin*. Springer.

Palanisamy, Rajkumar, Diwakar Karuppiah, Subadevi Rengapillai, Mozaffar Abdollahifar, Gnanamuthu Ramasamy, Fu-Ming Wang, Wei-Ren Liu, Kumar Ponnuchamy, Joongpyo Shim, and Sivakumar Marimuthu. 2022. "A Reign of Bio-Mass Derived Carbon with the Synergy of Energy Storage and Biomedical Applications." *Journal of Energy Storage*. https://doi.org/10.1016/j.est.2022.104422.

Ram, G. Dinesh, G. Dinesh Ram, S. Praveen Kumar, T. Yuvaraj, Thanikanti Sudhakar Babu, and Karthik Balasubramanian. 2022. "Simulation and Investigation of MEMS Bilayer Solar Energy Harvester for Smart Wireless Sensor Applications." *Sustainable Energy Technologies and Assessments*. https://doi.org/10.1016/j.seta.2022.102102.

Sumathy, B., Anand Kumar, D. Sungeetha, Arshad Hashmi, Ankur Saxena, Piyush Kumar Shukla, and Stephen Jeswinde Nuagah. 2022. "Machine Learning Technique to Detect and Classify Mental Illness on Social Media Using Lexicon-Based Recommender System." *Computational Intelligence and Neuroscience* 2022 (February): 5906797.

Thanigaivel, Sundaram, Sundaram Vickram, Nibedita Dey, Govindarajan Gulothungan, Ramasamy Subbaiya, Muthusamy Govarthanan, Natchimuthu Karmegam, and Woong Kim. 2022. "The Urge of Algal Biomass-Based Fuels for Environmental Sustainability against a Steady Tide of Biofuel Conflict Analysis: Is Third-Generation Algal Biorefinery a Boon?" *Fuel*. https://doi.org/10.1016/j.fuel.2022.123494.

Vickram, Sundaram, Karunakaran Rohini, Krishnan Anbarasu, Nibedita Dey, Palanivelu Jeyanthi, Sundaram Thanigaivel, Praveen Kumar Issac, and Jesu Arockiaraj. 2022. "Semenogelin, a Coagulum Macromolecule Monitoring Factor Involved in the First Step of Fertilization: A Prospective Review." *International Journal of Biological Macromolecules* 209 (Pt A): 951–62.

Yaashikaa, P. R., M. Keerthana Devi, and P. Senthil Kumar. 2022. "Algal Biofuels: Technological Perspective on Cultivation, Fuel Extraction and Engineering Genetic Pathway for Enhancing Productivity." *Fuel*. https://doi.org/10.1016/j.fuel.2022.123814.

Preethi, P. S., Hariharan, N. M., Vickram, S., Manian, R., Manikandan, S., Subbaiya, R., ... & Awasthi, M. K. (2022). Advances in

bioremediation of emerging contaminants from industrial wastewater by oxidoreductase enzymes. Bioresource Technology, 127444.

Tables and Figures

Table 1. Comparison of Lake water and Standard drinking water for analyzing the quality of water. The quality of water of Lake water of pH, color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 and Standard drinking water of pH, color, TDS, TSS and Turbidity is 7, 25,2000, 100 and 25.

Test Cases	**QUALITY OF WATER**									
	Lake Water					**Standard drinking water**				
	pH	Color	TDS	TSS	Turbidity	pH	Color	TDS	TSS	Turbidity
Sample1	6.4	20	833	28	12.2	7	25	2000	100	25
Sample2	6.3	21	837	27	12.4	7	25	2000	100	25
Sample3	6.7	19	840	29.3	12.7	7	25	2000	100	25
Sample4	6.5	18	834	31	12.6	7	25	2000	100	25
Test Results	**6.5**	**19**	**835**	**28**	**12.4**	**7**	**25**	**2000**	**100**	**25**

Table. 2. The statistical calculation such as Median, standard deviation and standard error Median for Lake water and Standard drinking water. The quality of water parameter used in the t-test. The mean quality of water of Lake water of pH, color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 and Standard drinking water of pH, color, TDS, TSS and Turbidity is 7, 25,2000, 100 and 25. The Standard Deviation of Lake water is 1.82833 and Standard drinking water is 0.82922. The Standard Error Median of Lake water is 2.28334 and Standard drinking water is 0.92827.

Levene's Test for Equality of Variances				**t**	**df**	**Sig. (2-tailed)**	**t-test Equality of Means**		**95% Confidence interval of the Difference**	
F	**Sig.**						**Mean Difference**	**Std.Error Difference**	**Lower**	**Upper**
pH	Equal variances assumed	1.500	0 .267	-3.797	6	0.009	-0.36250	0.09574	-0.59611	-.12889
	Equal variances not assumed			-3.797	4.412	0.016	-0.36250	.09547	-0.61809	-0.10691
Dissolved solid	Equal variances assumed	0.148	0 .714	4.541	6	0.004	6.02500	1.32689	2.77823	9.27177

	Equal variances not assumed			4.541	5.426	0.005	6.02500	1.32689	2.69310	9.35690
Suspended solid	Equal variances assumed	0.786	000.41	11.673	6	0.000	16.45000	1.40920	13.00182	19.89818
	Equal variances not assumed			11.673	5.605	0.000	16.45000	1.40920	12.94198	19.95802
	Equal variances assumed	12.550	0.012	-10.185	6	0.000	-11.32500	1.11196	-14.04587	-8.60413
Turbidity	Equal variances not assumed			-10.185	3.036	0.002	-11.32500	1.11196	-14.04587	-7.80960
Color	Equal variances assumed	8.527	0.027	-1.197	6	0.277	-30.37500	25.38403	-92.48748	31.73748
	Equal variances not assumed			-1.197	3.004	0.317	-30.37500	25.38403	-111.09928	50.34928

Table 3: The statistical calculations for independent samples test between Lake water and Standard drinking water. The sig. The quality of water is 0.026. Independent samples T-test is applied for comparison of Lake Water and Standard drinking water with the confidence interval as 95% and level of significance as 0.12323. This independent sample test consists of significance as 0.001, significance (2-tailed), Median difference, standard error difference, and lower and upper interval difference.

GROUP		**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
pH	Disposable standards	4	6.1125	0.08539	0.04270
	Lake water	4	6.4750	0.17078	0.08539
Dissolved solids	Disposable standards	4	23.0000	2.16025	1.08012

	Lake water	4	16.9750	1.54137	0.77069
Suspended solids	Disposable standards	4	28.7500	1.70783	0.85391
	Lake water	4	12.3000	2.24202	1.12101
Turbidity	Disposable standards	4	12.4250	0.17078	0.08539
	Lake water	4	23.7500	2.21736	1.10868
Color	Disposable standards	4	19.5000	1.29099	0.64550
	Lake water	4	49.8750	50.75164	25.37582

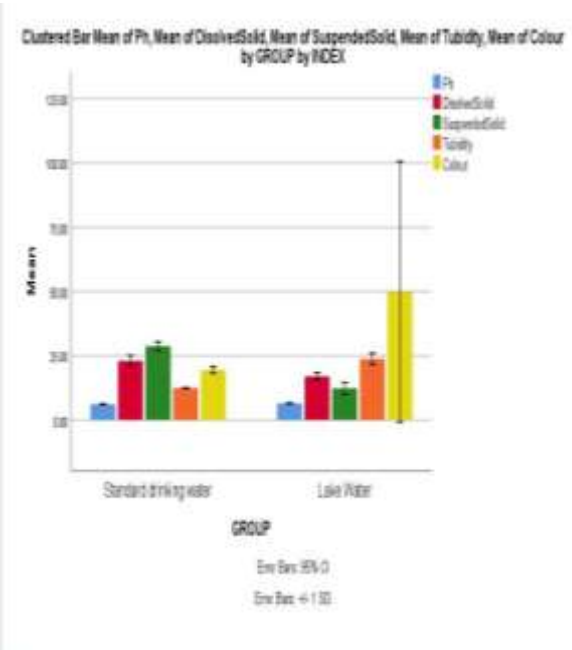

Fig. 1. Simple Bar graph for Lake water quality of water is compared with Standard drinking water. The mean quality of water of Lake water of pH, Color, TDS, TSS and Turbidity is 6.5, 19, 835, 28 and 12.4 and Standard drinking water of pH, Color, TDS, TSS and Turbidity is 7, 25, 2000, 100 and 25.Variable results with its standard deviation ranging from 80 lower to 90 higher Lake water where Standard drinking water standard deviation ranging from 90 lower to 100 higher. There is a significant difference between Lake water and Standard drinking water ($p<0.05$ Independent sample test). X-axis: Standard drinking water quality of water vs Lake water Y-axis: Median of quality of water, for identification of keywords ± 1 SD with 95 % CI.