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Comparative Physicochemical Study of Two Freshwater bodies: the Kaylana Lake and the Ranisar Talab of Jodhpur, Rajasthan

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ABSTRACT

Physicochemical components of any water body depend upon texture of soil and surrounding environment. The study has made an attempt to assess the variations in physico-chemical status of two urban water bodies- the Kaylana Lake and the Ranisar Talab of Jodhpur.

Physicochemical parameters such as conductivity, pH, temperature, transparency, total dissolved solids (TDS), total suspended solids (TSS), DO (Dissolved oxygen), BOD (Biological oxygen demand), total hardness, total alkalinity and chloride were evaluated from this observation, it is reported that there are marked variation in different physicochemical parameters of both urban water bodies during the study period. The value of water pH (7.8) was highest in Kaylana Lake. The highest values of other parameters like conductivity (212.40 µS/cm, total hardness (149.76 mg/l), DO (7.95 mg/l), TDS (132.25 mg/l), and chloride (54.94 mg/l) were found in the water of the Ranisar Talab. The study of both water bodies revealed that The Ranisar Talab's physicochemical parameters were more polluted than the Kaylana Lake.

Keywords: environment, physicochemical parameters, urban water bodies, eutrophication.

Introduction

People, animals and plants are living things. Water is not living thing but all living things need water to stay alive. People intake freshwater and it is just 1.2 percent of total water remain on earth (Kalman, B., 2007). Freshwater in urban areas mostly present in rivers, wells, ponds, canal and lakes.

Small reservoirs are comparatively important part of our civilized ecosystem, and they play vital role in several social, economic and environmental functions, viz. as a source of

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potable water, recharging ground water, acting as sponges to control flooding, conserve biodiversity and providing livelihood.

Water bodies have been used since time immemorial as a traditional source of water supply in India. The deterioration of freshwater quality is to be coming faster which leads to a global problem (Mahananda, et al, 2005).

The quality of freshwater gets affected by texture of soil, surrounding environment of water body and also due to human activities (Peters, N. E., and Meybeck, M., 2000).

Natural water bodies may contain different types of impurities in the various forms, such as weathering of rocks and leaching of soils, dissolution of aerosol particles from atmosphere (Patil, et al., 2012). The water of these reservoirs is polluted mainly due to discharge of waste water from the residential areas, sewage outlets, solids waste, detergents, automobile oil wastes, fishing facilities and agricultural pesticides from farmlands (Ma, et al., 2009). Several researchers (Cross, et al., 2005; Murry, et al., 2010; Thakur, et al., 2013) observed that freshwater is gradually becoming a scarce commodity due to extravagant pollution, over exploitation, etc. Hafizur, et al., (2017) reported that industrial waste water is being continuously added to water reservoirs which affect the physicochemical quality of water. Sahni, et al., (2012) observed that unrestrained discharge of domestic waste into the water body has responsible for pollution. The added unwanted substances can be classified as physical, chemical, biological and radiological impurities in addition to metal, pesticides, insecticides, commercial solvents, house garbage, decaying animal bodies, living micro and macro-organisms. Human being added unwanted components such as sewage, excess organic matters, sediments, petroleum products and garbage. Harmful chemicals may reach water bodies from improper application of fertilizers and pesticides in agricultural fields, decaying animal bodies, and human activities. Buser, et al., (1998) reported that the herbicide mecoprop (MCPP) and Clfibric acid (CA) were presented in Swiss lakes from populated areas in the North Sea.

All these impurities reflect as impurities of water, like bad taste, colour, odour, turbidity, hardness, high conductivity, corrosiveness, staining and frothing. Xiaolong, et al., (2010) reported that values of contaminants in dry season were obviously higher than those in wet season. Sites received industrial and urban influx showed higher contents of nutrients and

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lower levels of dissolved oxygen in water body; moreover, these locations were severely polluted by dissolved metals.

Water bodies have been used since time immemorial as a traditional source of water supply in India. People on globe, are under enormous threat menaces due to unsolicited changes in the biological, chemical and physical properties of water, air and soil. Shoot up in human population, unplanned urbanization, rapid industrialization, excess use of pesticides, fertilizers and other human activities responsible for pollution in water bodies. Nutrient concentration, soil texture and pH of water body are main factors responsible for proper growth and distribution of planktons in the reservoirs.

Factors responsible for ecological uniqueness of any ecosystem governed by physical, chemical and biological components and interaction among them result in the creation of a variety of niches which are inhabited by micro-organisms, plants and animals.

Dissolved oxygen (DO) is one of key factor, which plays crucial role in sustaining fauna. Organic carbon of soil is the amount of organic carbon hold by soil particles. Organic carbon enters the soil through the living and dead micro-organisms, decomposition of plants and animals' residues and its cycles throughout the carbon cycle. It has a vital impact of flora and fauna (Majumder, et al., 2015).

The present study is about the contamination status of both water bodies and role of human settlements. The present study ratifies some important physicochemical parameters like pH, conductivity, temperature, transparency, total dissolved solids (TDS), Biological oxygen demand (BOD), total suspended solids (TSS), total hardness, total alkalinity, hardness and chloride. The present study intended to highlight the physicochemical variation of the selected water bodies during the study period (Jan-Feb, 2020).

Material and methods

Description of study area

Jodhpur is also known as 'Suncity', situated at 26.23^{O} N, 73.02^{O} E and 231 m elevation above the sea level. The Kaylana Lake is one of main reservoir for Jodhpur city located between hilly area, and away from human habitat, while the Ranisar Talab is situated in old city and attached to dense human habitat. The water samples for physicochemical analysis were collected from these water bodies between 7:00 am to 9:00 am during winter season (Jan-Feb, 2020) for total 30 days.

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Collection of Water Samples

The samples were collected in plastic container from a depth of 10-15 cm below the surface water of each in three phases. The physicochemical characteristics of water like Biological oxygen demand (BOD), Dissolved Oxygen (DO), Total suspended solids (TSS), pH, temperature, transparency, total alkalinity, total hardness and chloride were determined by following standard method of APHA (2005).

Transparency, pH, temperature, conductivity, of the water were measured at their collection sites. Temperature was recorded with the help of digital thermometer, pH was recorded by digital pH meter, water transparency was measured by using black and white disc, and conductivity was measured by using hand conductivity meter (EC TESTER), whereas Dissolved Oxygen (DO) was measured by following Winkler's iodometric method. For the measurement of other physicochemical parameters, water samples were collected in plastic sampling bottles and transported to the laboratory. All the water samples collected in three phases during winter were analysed and expressed as Mean $\pm$ SD.

Results and Discussion

Comparative study on physicochemical data of the Kaylana Lake and the Ranisar Talab were recorded after collecting and analysed the water samples in three phases, and the Mean $\pm$ SD values of different water quality parameters are shown in Table 1.

Parameters	Kaylana Lake	Ranisar Talab
pH	7.4 $\pm$ 0.13	7.9$\pm$0.18
Transparency (cm)	66.9$\pm$2.35	52.5$\pm$1.62
Conductivity (µS/cm)	133$\pm$3.00	221.50$\pm$0.18
Temperature (oC)	13.5$\pm$0.12	14.02$\pm$0.18
TDS (mg/l)	121.44$\pm$21.25	141$\pm$21.41
DO (mg/l)	5.9$\pm$0.68	8.9$\pm$0.52
BOD (mg/l)	1.88$\pm$0.44	5.82$\pm$1.18
TSS (mg/l)	49.52$\pm$13.35	65.50$\pm$15.35
Total hardness (mg/l)	121.40$\pm$18.25	149.77$\pm$31.24
Total alkalinity (mg/l)	157.20$\pm$24.44	183.20$\pm$42.57
Chloride (mg/l)	37.40$\pm$ 3.88	54.77$\pm$4.24

The present study mainly focuses on the variations of water quality of these two water bodies during winter (Jan-Feb, 2020). The importance of physicochemical parameters in

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assessing water quality is well established (Simeonov, et al., 2003; Manjare, et al., 2010; Saad, et al., 2017; Parveen, et al., 2017). Bhatnagar, A., and Devi, P. (2013) reported that in increasing water temperature was responsible for reducing gases solubility in water body and for chemical and biological reactions.

During the present study period, there was no significance difference in temperature of the water of both water bodies. During study period temperature of the Kaylana Lake and the Ranisar Talab was 13.5^{o} C and 14.2^{o} C respectively.

pH is an important parameter which helps to determine the ionic balance of river water.

The corrosive nature of water regulated by pH, lower pH value higher, its corrosive nature. The pH also affects the solubility of many toxic and nutritive chemicals and also positively correlated with electrical conductance and total alkalinity (Garg, et al., 2009). Park, et al., (2003) reported that the higher pH values affected carbon dioxide and carbonate-bicarbonate equilibrium. The permissible limit of pH in drinking water is 6.5 to 8.5. In case of both water bodies, the value of the pH indicates that the water of the Kaylana Lake is alkaline in nature, while the Ranisar Talab's acidic.

Pogozhev, et al. (2006) reported that water transparency was depends upon eutrophication of lake and its also depend upon suspended solids and muddiness of the water body. It's was comparatively higher in the Kaylana Lake water than the Ranisar Talab. Water transparency mainly affected by the factors like rainfall, sun's position, angle of incidence of rays, visibility, cloudiness, turbidity and planktonic growth. The damages to benthic community are responsible for high turbidity (Thompson 2005).

Electrical conductivity is responsible for capacity of an aqueous solution to carry an electric current. It's depending on their total concentration, presence of ions, mobility valance, mobility and on the temperature of water. Electrical conductivity is a good indicator of water quality.

Kumar, N., & Sinha, D. K. (2010) concluded that the concentration of dissolved solids to be proportional to the ionic strength and claimed that the increase in conductivity may be due to leachate infiltration from soil. Conductivity of the Kaylana Lake (133 µS/cm) was lower than Ranisar Talab.

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Dissolved oxygen means present of dissolved oxygen present in water. DO (Dissolved oxygen) is also one of the most important parameters of water quality analysis. The presence of oxygen in water affected by salinity, altitude, temperature, inflow and photosynthesis activity of algae and plants (Sallam, et al. 2018; Bhateria, et al. 2016). Dissolved oxygen reduces when temperature of water body increases (Minami, et al. 1999). Dissolved oxygen in water body increases when phytoplankton increases (Smith, et al., 1988).

Xu, Z., and Xu, Y. J. (2016) reported that the fluctuation in dissolved oxygen was due to biological processes and formation of eutrophication of water body. DO level was found within optimum range in case of the Kaylana Lake (5.25 mg/l) but high in case of Ranisar Talab (8.44 mg/l). Biological oxygen demand (BOD) determination is the amount of dissolved oxygen required for the biochemical decomposition of organic compounds by micro-organisms and oxidation of certain inorganic materials. It is determination factor for the organic pollution (Jouanneau, et al., 2014). DO level was found within optimum range in case of the Kaylana Lake (5.25 mg/l) but high in case of the Ranisar Talab (8.44 mg/l).

To assess the organic pollution BOD determination is also one of key parameter (Vigiak, et al., 2019). It is also used for the measurement of the number of organic materials of a water body supporting the growth of microorganisms (Rustum, et al., 2008). BOD level was found 2.58 mg/l in the Kaylana Lake but 5.35 mg/l in the Ranisar Talab. So, water of the Ranisar contain higher concentration of microorganisms.

Total dissolved solids (TDS) are also crucial component in determining the water quality standards. It is sum of the all solids in dissolved forms either organic or inorganic (Adewuyi, et al., 2017). Several researchers (Zhang, et al., 2017; Sami, et al., 2021) reported that TDS is related to the degree of pollution. TDS were minimum during winter season. During the present study period, maximum value of total dissolved solids was recorded in the Ranisar Talab (136.22 mg/l) and minimum in case of the Kaylana Lake (108.22 mg/l). TDS (Total Dissolved Solids) composed of carbonates, bicarbonates, chlorides, phosphates, nitrates, organic matter, salts and other particles.

Total suspended solids (TSS) are solids components in water that can be trapped by a filter. TSS can included decaying plant and animal matter, sewage, any suspended solids, silt etc. It's may cause many problems for aquatic life. Total suspended solids (TSS) in case of the Kaylana Lake and the Ranisar Talab were found 49.55 mg/l and 68.08 mg/l, respectively.

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Alkalinity can neutralize strong acid (Schindler, 1986). Anion, viz. phosphate, hydroxyl, silicate, carbonate and bicarbonate are contributed alkalinity to water. Moss (1973) reported that the release or uptake of carbon dioxide by organisms might change the concentration of carbonate and bicarbonates in water. During summer the alkalinity increased due to higher concentration of nutrients (McKee, et al., 2003), but the alkalinity became decreased in monsoon and due to dilution of dilution by rainwater (Roelofs, 1991). Total alkalinity of Kaylana Lake (162.30 mg/l) was found to be lower than the Ranisar Talab (182.20 mg/l).

According to Etim, et al. (2013) total hardness of any water body indicates the concentration of calcium and magnesium in it. The present study revealed that the hardness of the Kaylana Lake and the Ranisar Talab was 127.30 mg/l and 147.83 mg/l respectively. The results indicate that the Ranisar Talab water contain higher concentration of calcium and magnesium.

Chloride anion is generally present in natural water. Hunt, et al. (2012) reported that excess amount of chloride in a water body may be due to sewage contamination or water softener discharge. Human and animal excreta along with industrial effluents contain huge quantities of chloride (Sarkar, et al., 2020). Chloride regulates salinity of water. During study period the Ranisar Talab's water sample contain 46.05 mg/l and the Kaylana Lake contain 22.15 mg/l respectively. The ecological significance of chloride lies in its potential to regulate salinity of water. Due to restrictions and away from human habitat, the concentration of chloride in the Kaylana Lake water was lower than the Ranisar Talab. The chloride content was higher in the Ranisar Talab due to sewage run-of from the streets. Excess amount of chloride in a water body may be due to sewage contamination or water softener discharge. Upadhyay and Chawla (2014) in their study found that the seasonal water quality assessment of surface water in Durg region (Chhattisgarh) and reported that chloride concentration value ranged from 53.23 mg/l to 172.70 mg/l. Goudar (2014) in his study on Choradi tank of Shivamogga and Karnataka found that the chloride concentration values range from 11.4 mg/l to 22.70 mg/l. Pawaiya et al. (2041) in their study on the physicochemical parametrs of Harsi reservoir of Dabra, Gwalior concluded that the chloride concentration ranged from 21.43 mg/l to 30.86 mg/l.

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Many researchers (Omezuruike, et al., 2008; Roa, 2011; Hong, et al., 2010) reported that microorganism are key bioindicators of freshwater lakes, and its presence and species composition is dependent on the nutrient condition, water temperature, water level and transparency. Variation in microorganism's species is affected by changing environment conditions.

Conclusion

The present study evaluated water quality of two different kinds of water bodies of Jodhpur, Rajasthan and a comparative analysis of key physicochemical parameters like transparency, pH, temperature, conductivity, BOD, DO, TDS, TSS, Total alkalinity, total hardness and chloride. Analysis of physicochemical parameters is very essential to test the water before it is used for domestic, agricultural, industrial or any other purposes. Therefore, it is necessary to check water quality before use it. In present study comparatively highest level of pollution status was observed in the Ranisar Talab than the Kaylana Lake due to presence of higher content of chloride, nitrate and BOD.

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References

Adewuyi, G. K., Badejo, O. T., Idowu, F. F., Ogunjobi, G. A., and Ghopa, A. O. (2017). Analysis of physico-chemical parameters: an empirical study of Yewa River Ogun and part of Badagry Creek, Lagos, Southwest Nigeria. *International Journal of Hydrology*, 1(7), 202-211.

APHA. (2005). Standard Methods for the Examination of Water and Waste water, *American Public Health Associaton*, 21st Ed.

Bhateria, R., and Jain, D. (2016). Water quality assessment of lake water; a review. Sustainable Water Resources Management, 2(2), 161-173.

Bhatnagar, A., & Devi, P. (2013). Water quality guidelines for the management of pond fish culture. *International journal of environmental sciences*, 3(6), 1980-2009.

Buser, H. R., Muller, M. D., and Theobald, N. (1998). Occurrence of the pharmaceutical drug clofibric acid and the herbicide mecoprop in various Swiss lakes and in the North Sea. *Environmental Science and Technology*, 32(1), 188-192.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, Iss 8, Dec 2022

Cross, W. F., Benstead, J. P., Frost, P. C., & Thomas, S. A. (2005). Ecological stoichiometry in freshwater benthic systems: recent progress and perspectives. *Freshwater Biology*, 50(11), 1895-1912.

Etim, E. E., Odoh, R., Itodo, A. U., Umoh, S. D., and Lawal, U. (2013). Water quality index for the assessment of water quality from different sourced in the Niger Delta Region of Nigeria. *Frontiers in science*, 3(3), 89-95.

Garg, R. K., Rao, R. J., and Saksena, D. N. (2009). Water quality and conservation management of Ramsagar reservoir, Datia, Madhya Pradesh. *Journal of Environmental Biology*, 30(5), 909.

Goudar, M. A., (2014). Assessment of tank water quality in realtion to some physicochemical parameters-a case study in Choradi tank of Shivamogga, Karnataka, India. *International Journal of Pharma and Bio Sciences*. 5(3): (P) 569-575.

Hafizur, R. M., Nuralam, H. M., and Rumainual, I. M. (2017). Investigation of Physicochemical Parameter, Heavy Metal in Turag River Water and Adjacent Industrial Effluent in Bangladesh. *Journal of Science, technology and environment informatics*, 5(1), 347-360.

Hong, H., Qiu, J., and Liang, Y. (2010). Environmental factors influencing the distribution of total and faecal coliform bacteria in six water storage reservoirs in the Pearl River Delta Region, China. *Journal of Environmental Sciences*, 22(5), 663-668.

Hunt, M., Herron, E. and Green, L., (2012). Chloride in Fresh Water. *URI watershed watch*. 4(3).

Jouanneau, S., Recoules, L., Durand, M. J., Boukabache, A., Picot, V., Primault, Y., and Thouand, G. (2014). Methods for assessing biochemical oxygen demand (BOD): A review. Water research, 49, 62-82.

Kalman, B. (2007). Living things need water. Crabtree Publishing Company.

Roa, B. V. (2011). Physicochemical analysis of selected ground water samples of Vijayawada rural and urban in Krishna district, Andhra Pradesh, India. *International journal of environmental sciences*, 2(2), 710-714.

Thompson, J. K. (2005). One estuary, one invasion, two responses: phytoplankton and benthic community dynamics determine the effect of an estuarine invasive suspension-feeder. In *The comparative roles of suspension-feeders in ecosystems* (pp. 291-316). *Springer*, Dordrecht.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, Iss 8, Dec 2022

Kumar, N., & Sinha, D. K. (2010). Drinking water quality management through correlation studies among various physicochemical parameters: A case study. *International journal of environmental sciences*, *1*(2), 253-259.

Ma, J., Ding, Z., Wei, G., Zhao, H., and Huang, T. (2009). Sources of Water Pollution and Evolution of Water Quality in the Wuwei Basin of Shiyang River, Northwest China. *Journal of Environmental Management*, 90(2), 1168-1177.

Majumder, S., Dhua, R. P., Kar, S., Mishra, T., Mahapatra, S. s., Shit, S., and Patra, A. (2015). Zooplankton Diversity influence by Hydro biological Parameters in Some Ponds of South Eastern Part of Bankura Town of WB, India. *International Journal of Advanced Research*, 3(5), 354-368.

Mahananda, H. B., Maahananda, M. T., and Mohanty, B. P. (2005). Studies on the physico-chemical and biological parameters of a fresh water pond ecosystem as an indicator of water pollution. *Ecology environment and conservation*, 11(3/4), 537.

Manjare, S. A., Vhanalakar, S. A., and Muley, D. V. (2010). Analysis of water quality using physicochemical parameters Tamdalge tank in Kolhapur district, Maharashtra. *International Journal of Advanced Biotechnology and Research*, 1(2), 115-119.

Minami, H., Kano, Y., and Ogawa, K. (1999). Long-term variations of potential temperature and dissolved oxygen of the Japan Sea Proper Water. *Journal of oceanography*, 55(2), 197-205.

McKee, D., Atkinson, D., Collings, S. E., Eaton, J. W., Gill, A. B., Harvey, I. and Moss, B. (2003). Response of freshwater microcosm communities to nutrients, fish, and elevated temperature during winter and summer. *Limnology and Oceanography*, 48(2), 707-722.

Moss, B. (1973). The influence of environmental factors on the distribution of freshwater algae: an experimental study: II. The role of pH and the carbon dioxide-bicarbonate system. *The Journal of Ecology*, 157-177.

Murray, K. E., Thomas, S. M., & Bodour, A. A. (2010). Prioritizing research for trace pollutants and emerging contaminants in the freshwater environment. *Environmental pollution*, *158*(12), 3462-3471.

Omezuruike, O. I., Damilola, A. O. Adeola, O. T., Fajobi, E. A., and Shittu, O. B. (2008). Microbiological and physicochemical analysis of different water samples used for domestic

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, Iss 8, Dec 2022

purposes in Abeokuta and Ojota, Lagos State, Nigeria, *African Journal of Biotechnology*, 7(5), 617-621.

Park, J. Y., Yoon, S. J., and Lee, H. (2003). Effect of steric hindrance on carbon dioxide absorption into new amine solutions: thermodynamic and spectroscopic verification through solubility and NMR analysis. *Environmental science and technology*, 37(8), 1670-1675.

Parveen, S., Bharose, R., and Singh, D. (2017). Assessment of phsico-chemical properties of tannery waste water and its impact on fresh water quality. *International Journal of Current Microbiology and Applied Sciences*, 6(4), 1879-1887.

Patil, P. N., Sawant, D. V., and Deshmukh, R. N. (2012). Physico-chemical Parameters for Testing of Water-A Review. *International Journal of Environmental Science*, 3(3), 1194.

Pogozhev, P. I., and Gerasimova, T. N. (2011). The role of zooplankton in the regulation of phytoplankton biomass growth and water transparency in water bodies polluted by nutrients. *Water Resources*, 38(3), 400-408.

Pawaiya, N., Sharma, D. K. and Kushwah, M. K. S., (2014). Analysis of Physico-chemical Parameters in Harsi Reservoir Dabra, Gwalior District, Madhya Pradesh. *International Journal of Innovation and Scientific Research*. 11(2): 248-258.

Peters, N. E., and Meybeck, M. (2000). Water Quality Degradation Effects on Freshwater Availability: Impacts of Human Activities. *Water International*, 25(2), 185-193.

Roa, B. V. (2011). Physicochemical analysis of selected ground water samples of Vijayawada rural and urban in Krishna district, Andhra Pradesh, India. *International journal of environmental sciences*, 2(2), 710-714.

Roelofs, J. G. M. (1991). Inlet of alkaline river water into peaty lowlands: effect on water quality and Stratiotes aloides L. stands. *Aquatic Botany*, 39(3-4), 267-293.

Rustum, R., Adeloye, A. J., and Scholz, M. (2008). Applying Kohonen self-organizing map as a software sensor to predict biochemical oxygen demand. *Water Environment Research*, 80(1), 32-40.

Saad, A. S., Massoud , M. A., Amer, R. A., and Ghorab, M. A. (2017). Assessment of the physicochemical characteristics and water quality analysis of Mariout Lake, Southern of Alexandria, Egypt, *J Environ and Toxicol*, 7(1), 2-19.

Sahni, K., and Yadav, S. (2012). Seasonal Variation in Physico-chemical Parameters of Bharawas Pond, Rewari, Haryana. *Asian J. Exp. Sci*, 26(1), 61-64.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, Iss 8, Dec 2022

Sallam, G. A., and Elsayed, E. A. (2018). Estimating relations between temperature, relative humidity as independed variable and selected water quality parameters in Lake Manzala, Egypt. *Ain Shams Engineering Journal*, 9(1), 1-41.

Sami, B. H. Z., Sami, B. F. Z., Fai, C. M., Essam, Y., Ahmed, A. N., and El-Shafie, A. (2021). Investigating the reliability of machine learning algorithms as a sustainable tool for total suspended solid prediction. *Ain Shams Engineering Journal*, 12(2), 1607-1622.

Sarkar, R., Ghosh, A. R., and Mondal, N. K. (2020). Comparative study on physicochemical status and diversity of macrophytes and zooplanktons of two urban ponds of Chandannagar, WB, India. *Applied Water Science*, 10(2), 1-8.

Schindler, D. W. (1986). The significance of in-take production of alkalinity. Water, Air, and Soil Pollution, 30(3), 931-944.

Simeonov, V., Strais, J. A., Samara, C., Zachariadis, G., Voutsa, D., Anthemidis, A., and Kouimtzis, T. (2003). Assessment of the Surface Water Quality in Northern Greece. *Water research*, 37(17), 4119-4124.

Smith, D. W., and Piedrahita, R. H. (1988). The relation between phytoplankton and dissolved oxygen in fish ponds. *Aquaculture*, 68(3), 249-265.

Thakur, R. K., Jindal, R., Singh, U. B., & Ahluwalia, A. S. (2013). Plankton diversity and water quality assessment of three freshwater lakes of Mandi (Himachal Pradesh, India) with special reference to planktonic indicators. *Environmental monitoring and assessment*, *185*(10), 8355-8373.

Upadhyay, M. and Chawla, J. K., (2014). Seasonal water quality assessment of surface water in Durg region. *International Journal of Pharmaceutical Research and Analysis*. 4(2):90-92.

Vigiak ,O., Grizzetti, B., Udias-Moinelo, A., Zanni, M., Dorati, C., Bouraoui, F., and Pistocchi, A. (2019). Predicting biochemical oxygen demand in European freshwater bodies. *Science of the Total Environment*, 666, 1089-1105.

Xiaolong, W., Jingyi, H., Ligang, X., and Qi, Z. (2010). Spatial and Seasonal Variations of the Contamination Within Water Body of the Grand Canal, China. *Environmental Pollution*, 158(5), 1513-1520.

Xu, Z., and Xu, Y. J. (2016). A deterministic model for predicting hourly dissolved oxygen change: development and application to a shallow eutrophic lake. *Water*, *8*(2), 41.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, Iss 8, Dec 2022

Zhang, C., Zhang, W., Huang, Y., and Gao, X. (2017). Analysis the correlations of long-term seasonal water quality parameters, suspended solids and total dissolved solids in a shallow reservoir with metrological factors. Environmental Science and Pollution Research, 24(7), 6746-6756.