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Studies on Physico-Chemical Parameters of Water in Ponds and Lakes of India

Lakhwinder Singh[1], Ramandeep Achint[2], Veerpal Kaur[3]

[1]Research scholar, School of Bio Sciences, RIMT University, Mandi Gobindgarh, Punjab, India, 147301
[2]Assistant Professor, School of Bio Sciences,RIMT University, Mandi Gobindgarh, Punjab, India, 147301
[3]Assistant Professor, Department of Zoology and Fisheries Sciences, Dolphin (PG) College of Science and Agriculture, Chunni Kalan, Fatehgarh, Punjab, India, 140406

Abstract:
Water supports life on earth and so in aquatic ecosystems such as ponds and lakes. The increased population rate, agriculture, industries contributed to pollution of pond and lakes. So there is need to determine the chemical, physical and biological characteristics of natural water resources system as quality of water resources depends on a large number of physico-chemical parameters and also to identify magnitude and source of any pollution load. These physico-chemical parameters of lakes and ponds also play an important role in designing conservation strategies if water bodies found polluted. This review summarized the work done by various researchers on physico-chemical parameter analysis of water in ponds and lakes,

Keywords: Water, Physico-chemical parameters, Ponds, Lakes

INTRODUCTION

Life was born as a result of water, from plants to animals to humans. 70% of the world's surface is covered by water, but out of all of the world's water, 97% is salt water in oceans and seas and in saline groundwater. Freshwater ecosystems including ponds and lakes exhibit complex physiochemical dynamics that play a crucial role in determining the overall health and ecological balance of pond and lake ecosystems. The physico-chemical characteristics of water affect the abundance, species composition, stability and productivity of the indigenous populations of aquatic organisms. Monitoring physiochemical parameters helps assess the overall water quality and ecological health of aquatic ecosystems. It helps to identify potential threats to biodiversity and informs conservation efforts. The studies on the physiochemical characteristics of ponds and lakes provide valuable insights into highlighting the need for effective water quality management strategies to maintain the ecological balance of these ecosystems. Fresh water has become a scare commodity due to over exploitation and pollution, population growth, rapid urbanization, industrialization, agriculture run off (Ghosh and Basu 1968; Gupta and Shukla 2006).

REVIWE OF LITERURE

The growing importance of ponds and lakes leads the researchers to put all efforts to understand the interaction of biotic and abiotic factor in the aquatic ecosystem. The major step from hydrobiology to

limnology was taken by F.A. Forel (1814-1912). F.A. Forel is known as father of modern Limnology.
After 1918, limnology became more completely an integrated and coherent branch of science. Birge and Juday (1911) can be regarded as the pioneer of scientific limnology. Also some important studies include West and West, 1912; Hynes, 1960; Coll and Forsyth, 1973; Selgeby and Jones, 1974; Best and Traill, 1994; Simona et al., 1999; Hinder et al., 1999.
The important contribution in the field of aquatic biology in India include Sarwar and Wazir, 1991; Kumar and Sharma, 1991; Khan, 1996; Dixit et al., 2000; Nandan et al., 2001; Srivastava et al., 2003; Singh and Mathur, 2005; Chowdhury and Mamun, 2006; Narayan et al., 2007; Kumke et al., 2007; Bhatt et al., 2007; Bhandari and Nayal, 2008.
Ansari et al. (2008) made limnological studies with special reference to Unkal Lake, Karnataka and recorded the range of pH of the lake between 7.4-8.9, which may be high due to buffering capacity of the system and also observed positive correlation between Biological oxygen demand (BOD) and temperature. Mathur et al. (2008) determined various physico-chemical characteristics of Pushkar Lake, Ajmer, Rajasthan and found the lake water to be alkaline with higher concentration of chloride, conductivity, hardness, lower concentration of dissolved oxygen and every parameter showed significant correlation with increased pollution of water in lake. It was also observed that eutrophication, anthropogenic activities, holy rituals and tourism were the major factors which affect the water quality in lake.
Ibrahim et al. (2009) studied seasonal variations in abiotic factors of Lotus Lake, Maharashtra and recorded maximum air temperature, water temperature, total dissolved solids, free carbon-dioxide, total hardness and chlorides in summer season.
Srivastava et al. (2009) studied physico-chemical parameters of Jalmahal, Amer, Nevta and Ramgarh Lakes around Jaipur for one year and observed Jalmahal Lake to be most polluted with high value of alkalinity, free carbon-dioxide, hardness, pH and low dissolved oxygen whereas Ramgarh Lake was found to be least polluted and most suitable for biota and fish amongst all other lakes.
Pathania et al. (2009) studied physicochemical parameters fish pond in Jalandhar, Punjab, India and found value of dissolved oxygen ranged from 8.5 to 11.5 mg/L indicating it suitable for fish growth.
Gupta et al. (2011) investigated three lakes such as Maota Lake, Jal Mahal Lake and Galta Lake of Jaipur for various water parameters like water temperature, pH, alkalinity, total hardness and dissolved oxygen. Highest (as per ICMR, 1975) values of pH (8.5), hardness (120 mg/L), alkalinity (460 mg/L) and lowest value of dissolved oxygen (460 mg/L) were observed at Jal Mahal Lake. Based on the values of all parameters, Jal Mahal Lake was reported to be highly polluted amongst all followed by Maota and Galta Lakes.
Patil et al. (2011a) conducted study on physico-chemical parameters of three lakes of Kohlapur, Maharashtra (Bhasbhavan Department Lake, Music Department Lake and Rajaram Lake). Their study revealed that all the studied parameters were found to be in permissible limits except BOD, COD and phosphate and various anthropogenic activities lead to contamination of Rajaram Lake more than other two lakes.
Patil et al. (2011b) studied physico-chemical parameters of Lotus Lake, Maharashtra and observed that chlorides showed positive correlation with photoperiod and some other factors such as air temperature, water temperature, total hardness, TDS, free carbon-dioxide and phosphates which also affect the value of pH.
Ahangar et al. (2012) calculated physico-chemical characteristics of Anchar Lake, Kashmir and found

higher values of chlorides during summer due to the sewage contamination, increased temperature and higher evaporation rate and lower value in winter season due to dilution factor caused due to rain water entering into the lake. Bhagwat and Bhandarkar (2012) studied physico-chemical characteristics of water quality of Bemla Dam, Rajasthan and observed mineral rocks and rain water to be the sources of sulphates.

Naik et al. (2012) studied Kunigal Lake, Karnataka for a period of two years (2007-2009) and reported higher amounts of total dissolved salts, high turbidity whereas poor dissolved oxygen was observed. Furthermore, water quality was observed to be deteriorated due to anthropogenic activities, heavy inflow of domestic waste and sewage.

Patel and Patel (2012) estimated physico-chemical parameters of two lakes i.e Lodra Lake and Nardipur Lake of Gandhinagar, Gujarat, India and found alkaline pH, high alkalinity, low dissolved oxygen in both lakes and observed that both lakes were polluted due to continuous discharge of domestic used like sewage, drainage, cleaning clothes, cattle and vehicle washing a run off high amount of nutrients which lead to eutrophication whereas Lodra Lake was found to be comparatively more polluted due to greater biotic stress.

Verma et al. (2013) assessed water parameters of Nikol Lake, eastern Ahmedabad, Gujarat and found water quality to be deteriorated which greatly disturbed the ecological status of lake.

Biradar et al. (2014) calculated physico-chemical parameters of Kotur Lake, Dharwad, Karnataka from October 2011- March 2012 and results revealed that most of parameters were not within permissible limits and various factors affects water quality. So, the lake water was unfit for drinking and for agricultural use.

Deepthi et al. (2014) conducted study on abiotic parameters of Varuna, Madappa and Giribettethe Lakes of Mysore, Karnataka and results showed that Varuna Lake was moderately polluted followed by Madappa Lake and Giribettethe Lake which were severely polluted.

Singh (2015) studied abiotic parameters of pond in Bharatpur, Rajasthan and found water quality to be poor due to anthropogenic activities. Bheemappa et al. (2015) studied temporal variation in water quality parameters of Bandematta Hosakere Lake, Karnataka, India and calculated high values of electrical conductivity, total dissolved solids, BOD, nitrates, total hardness and also recorded high levels of variations in various physico-chemical parameters due to anthropogenic activities and discharge of waste water.

Khade (2015) calculated different physico-chemical parameters from Pohara Lake (Malkhed), Chatri Lake and Wadali Lake and observed various parameters to be within permissible range and water quality was found to be good to support fish farming and for human consumption.

Pavan and Benarjee (2015) studied abiotic parameters in an urban lake of Warrangal and recorded significant increase in various physico-chemical parameters like temperature, electrical conductivity, COD during monsoon season and increased nitrate and phosphate concentration in post-monsoon season and high levels of calcium, magnesium in pre-monsoon season.

Saha et al. (2017) analysed physico- chemical parameter of three urban ponds (P1, P2 & P3) Nadia, West Bengal and observed that pond 3 health status was significantly inferior due to anthropogenic activities. But P2 is better than P1 because of less human interference with pond ecosystem like idol immersion, washing of utensils, clothes and vehicles.

Gosh (2018) conducted study on physico-chemical parameters on pond water in Purba Barddhaman, West Bengal, India and found that pond was suitable for fish farming.

Shukla et al. (2020) studied water quality of differ water bodies including ponds and reservoirs of Punjab and found high values of various parameters and observed that water pollution was caused by various industries.

Dawar and Sohani (2022) studied physico- chemical quality of Nehtada pond, Alirajpur, Madhya Pradesh, India and observed good status of water as most of the parameters like electrical conductivity, chloride, fluoride, magnesium, alkalinity, hardness and TDS (Total Dissolved Solids) were inpermissible limit as per WHO.

Gujjar (2023) conducted study on physico-chemical parameters of two ponds viz. Dantaramakkiand and Hiremagaluru in Chikmagalur, Karnataka, India and found mesotrophic status of pond and suggested to take preventive measures to improve water quality of pond.

Kumar and Singh (2023) evaluated water and ecological status of Taj Baj pond, Hajipur, Bihar and found toxic substances in water and water quality was poor thereby declining the growth, reproduction causing mortality to cultured species.

Kumar et al. (2023) studied physico-chemical parameters of selected aquaculture ponds water in Bhimavaram mandal, W. G, Andhrapradesh, India and observed that production of fish was dependent on physical, chemical and biological properties of water and study of water quality provide useful information to determine productivity of fish.

Mishra (2023) analysed physicochemical of four ponds in Distt. Kaushambi, U. P. and found that water quality had been devastated due to human activities and there was need to take immediate action.

Rani et al. (2023) observed physico- chemical and minerals status from different ponds in Sonipat, Harayana, India and found that ponds along the sides of roads and villages were more contaminated than the other sites.

Shivashankar and Alavandi (2023) analyzed physico-chemical parameter of three ponds: Arsikere pons, Kellengere Kere, Kallanaikanahalli Kere and observed water quality to be poor and analysis also gives very important information to maintain health of aquatic habitat.

Singh et al. (2023) evaluated water parameters of Mahil Pond in Orai, U. P. India and found that alkalinity was on the higher side and found that water was unfit for resident organisms.

Singh and Chaurasia (2023) conducted comparative physico-chemical study on three pond ecosystems in Kota, Rajasthan and observed large qualitative variations among parameters and vegetations of three ponds and found the study to be very useful for controlling the physico-chemical and biological condition of water.

CONCLUSION

This study provide insight into water quality of different pond and lakes in India and also proved to useful in designing conservation strategies for polluted lakes and ponds.

REFERENCES

1. Ghose, B.B., Basu, A.K., “Observation on estuarine pollution of the Hooghly by the effluents from a chemical factory complex at Rashasa, West Bengal”, Environment Health, 1968, 10, 29-218.
2. Gupta, S. and Shukla, D, N., “Physico-Chemical analysis of sewage water and its effect on seed germination and seedling growth of sesamum indicum”, J Nat-Ras. Development, 2006, 1, 5-19.
3. Birge, E.A., Juday, C., “The inland lakes of Wisconsin. The dissolved gases of the water and their biological significance”, Wisconsin Geological and Natural History Survey Bulletin (Science

Series), 1911, 22(7), 259.
4. West, W., West, G.S., "On the periodicity of phytoplankton of some British Lakes. Botanical Journal of Linnean Society", 1912, 40, 395-492.
5. Hynes, H.B., "The Biology of Polluted Water. Liverpool University Press, Liverpool",1960, 202.
6. Coll, R.H.S., Forsyth, D.J., "The limnology of a thermal Lake: Lake Rotowhero, New Zealand", Journal of General Description and Water Chemistry Hydrobiology, 1973, 43(3-4), 313-332.
7. Selgeby, J.H., Jones, W.E., "Physical and Chemical Characteristics of Lake Oahe", Journal of U.S. Fish and Wildlife services, Washington, D.C, 1974.
8. Best, G.A., Traill, I., "The physico-chemical limnology of Loch Lomond", Hydrobiologia, 1994, 290: 29-37.
9. Simona, M., Barbieri, A., Veronesi, M., Malusardi, S., Straskrabova, V., (1999), "Seasonal dynamics of plankton in a mountain Lake in the Southern Alps (Laghetto Inferiore, Switzerland)", Journal of Limnology, 1999, 58(2), 169-178.
10. Hinder, B., Gabathuler, M., Steiner, B., Hanselmann, K., Preisig, H.R., "Seasonal dynamic and phytoplankton diversity in high mountain Lakes (Jori Lakes, Swis Alps)", Journal of Limnology, 1999, 59, 152-161.
11. Sarwar, S.G., Wazir, M.A., "Physico-chemical characteristics of fresh water Pond of Srinagar (Kashmir)", Pollution Research, 1991, 10(4), 233-237.
12. Kumar, S., Sharma, L.L., "Comparative physico-chemical limnology of Lake Pichhola and Fatehsagar, Udaipur (Rajasthan)", Pollution Research, 1991, 10(3), 173-178.
13. Khan, M.A., "The phytoplankton periodicities of two warm climate Lakes subject to marked seasonal variability, Journal of Tropical Ecology, 1996, 12(4), 461-474.
14. Dixit, A.S., Hall, R.I., Leavitt, P.R., Quinland, R., Smol, J.P., "Effect of sequential depositional on Lake response to urban and agricultural pollution: A palaeoecological analysis of a Quell Appelle Valley, Saskatchewan, Canada", Fresh Water Biology, 2000, 43, 319-337.
15. Nandan, S.N., Mahajan, S.R., Kumavat, M.R., Jain, D.S., "Limnological study of Hartala Lake of Jalgaon, Maharastra", In: Proceedings of 88th Indian Science Congress. New Delhi, 2001, 3, 1-2.
16. Srivastava, N., Agarwal, M., Tyagi, A., "Study of physico-chemical characteristics of water bodies around Jaipur", Journal of Environmental Biology, 2003, 24(2),177-180.
17. Singh, R.P., Mathur, P.,"Investigation of variation in physico-chemical parameters of a freshwater Reservoir of Ajmer city, Rajasthan", Indian Journal of Environmental Sciences, 2005, 9(1), 56-61.
18. Chowdhury, A.H., Mamun, A.A., "Physico-chemical conditions and plankton population of two fish Pond in Khulna", Journal of Zoology, Rajshahi University, 2006, 25, 41-44.
19. Narayan, R., Saxena, K.K., Chauhan, S., "Limnological investigation of Texi Temple Pond in the District Etawah (U.P.)", Journal of Environmental Biology, 2007, 28(1), 155-157.
20. Kumke, T., Ksenofontova, M., Pastry Akova, L., Nazarova, L., Hubberten, H.W., " Limnological characteristics of Lakes in the lowlands of Central Yakutia, Russia", Journal of Limnology, 2007, 66(1), 40-53.
21. Bhatt, M.P., Masuzawa, T., Yamamota, M., Takeuchi, N., "Chemical characteristics of pond waters within the debris area of Lirung Glacier in Nepal Himalayas", Journal of Limnology, 2007, 66(2), 71-80.
22. Bhandari, N.S., Nayal, K., "Correlation study on physico-chemical parameters and quality assessment of Kosi River water, Uttarakhand", E-Journal of Chemistry, 2008, 5(2), 342-346.

23. Ansari, M.F., Ankalgi, R.F., Ankalgi, S.R., "Studies on physico-chemical aspects and plankton of Unkal Lake at Hubli (Karnatka, India)", In: Proceedings of Taal 2007: The 12th World Lake Conference, Jaipur, India (eds. M. Senugupta.,R. Dalwani),2007, 1687-1694.
24. Mathur, P., Agarwal, S., Nag, M., "Assessment of physico-chemical characteristics and suggested restoration measures for Pushkar Lake, Ajmer, India", In: Proceedings of Taal 2007: The 12thWorld Lake Conference, Jaipur, India (eds. M. Senugupta and R. Dalwani), 2008, 1518-1529.
25. Ibrahim, B.U., Auta, J., Balogun, J.K., " An assessment of the Kontagora reservoir, Niger State, Nigeria, Bayero", Journal of Pure and Applied Sciences, 2009, 2(1), 64-69.
26. Srivastava, N., Harit, G., Srivastava, R., "A study of physico-chemical characteristics of Lakes around Jaipur", Indian Journal of Environmental Biology, 2009, 30(5), 889-894.
27. Pathania, D., Sabesan, M., Kumari. S. "Seasonal Variation in Physico-Chemical Parameters and Planktons Population of Fish Pond in Jalandhar, Punjab", Asian Journal of Water, Environment and Pollution, 2009, 7(1), 123-128.
28. Gupta, P., Agarwal, S., Gupta, I, "Assessment of physico-chemical parameters of various Lakes of Jaipur, Rajasthan, India", Indian Journal of Fundamental and Applied Life Sciences., 2011,1(3), 246-248.
29. Patil, S.G., Goroba, C.S., Suhas, J.A., Raut, P.D., "Study of physico-chemical and biological characteristics of Lakes from Shivaji University Campus Kohlapur, Maharashtra", Advances in Applied Sciences Research, 2011a, 2(6), 505-519.
30. Patil, J.V., Ekhande, A.P., Padate, G.S., "Study of Lotus Lake: Its abiotic factors their correlation with reference to seasonal changes and altitude", Annuals of Biological Research, 2011b, 2(4), 44-56.
31. Ahangar, I.A., Saksena, D.N., Mir, M.F., Ahangar, M.A., "Seasonal variations in physico-chemical characteristics of Anchar Lake, Kashmir", International Journal of Advanced Biological Research, 2012, 3(2), 352-357.
32. Bhagwat, P.H., Bhandarkar, S.E., "Physico-chemical characteristics of water quality of Bemla Dam Babulgaon, District Yavatmal", International Journal of Basic and Applied Research, 2012, Special Issue, 179-182.
33. Naik, T.P., Ajayan, K.V., Lokesh, G.H., "Physico-chemical characteristics of Kunigal Lake in Tumkur District, Karnataka, India", International Journal Chemical Science, 2012, 10(2), 655-663.
34. Patel, A.C., Patel, R.S. (2012), "Comparison of the physico-chemical parameters of two Lakes at Lodra and Nardipur under biotic stress", International Journal of Scientific and Research Publications, 2012, 2(9), 1-7.
35. Verma, P.U., Chandawat, D.K., Solanki, H.A., "Pollution status of Nikol Lake located in eastern Ahmedabad, Gujarat, India", International Journal of Innovative Research in Science, Engineering and Technology, 2013, 2(8), 3603-3609.
36. Biradar, N.V., Sindagi, A.S., Bellad A.S., Reddy, J., Ravi, N., Shivaraj, N., Raj, M.P., Sadashiv, S.O., Chandrashekhar, U., "Assessment of physico-chemical and microbiological parameters of Kotur Lake, Dharwad, Karnataka, India", Research Journal of Recent Sciences, 2014, 3(11), 57-62.
37. Deepthi, S., Sadanand, M., Yamakanamard., "Water quality index and abundance of total zooplankton in Varuna, Madappa and Giribettethe Lakes of Mysore, Karnataka State, India", International Journal of Environmental Sciences, 2014, 4(5), 683-693.
38. Singh, S., "Analysis of Plankton Diversity and Density with Physico-Chemical Parameters of Open

Pond in Town Deeg (Bhratpur) Rajasthan, India", International Research Journal of Biological Sciences, 2015, 4(11), 61-69.
39. Bheemappa, K., Nandini, N., Kumar, M.V., Raghavendra, M., "Temporal variation in water quality parameters of Bandematta Hosakere Lake-Peri urban area of Bengaluru, Karnataka, India", International Journal of Advanced Research, 2015, 3(7), 1283-1291.
40. Khade, R.J., "Study of physico-chemical parameters of water from different Lakes in Amravati", Indian Journal of Applied Research, 2015, 5(1), 59-60.
41. Pavan, M., Benarjee, G., "Studies on physico-chemical parameters and occurrence of heavy metals in an urban Lake of Warrangal district during different seasons", International Journal of Plant, Animal and Environmental Sciences, 2015, 5(3), 110-116.
42. Saha, S., Mandal, A., Sahoo, D., "Study of physic-chemical parameters of three different urban pond water of Nadia district, West Bengal, India", International Journal of Fisheries and Aquatic Studies, 2017, 5(6), 23-27.
43. Gosh, B.B., "Physicochemical analysis of pond water in Purba Barddhaman, West Bengal, India", International Journal of Environmental Sciences, 2018, 7(2), 54-59.
44. Shukla, B.K., Sharma, P.K., Khan, M.A., "Physico-Chemical Study of Some Surface Water Bodies of Punjab", Journal of Physics: Conference Series, 2020, 15-31.
45. Dawar, M., Sohani, S., "Study of physico-chemical parameters of nehtada pond water in district Alirajpur, Madhya pradesh, India", International Journal of Creative Research Thoughts (IJCRT), 2022, 741-747
46. Gujjar, K.N., "Comparative studies on the physico-chemical parameters of Dantaramakkiand Hiremagaluru pond water in Chikmagalur", International Journal of Creative Research and Thoughts, 2023, 11,774-781.
47. Kumar, D., Singh, B.B.P., "Water quality parameters and ecological status of eutrophicated Taj Baj POND Hajjipur (Vaishali)", Research Journal of Science and Technology, 2023, 15(2), 88-4
48. Kumar, N.V., Kumar, B.A., Swamy, G.r., Raju, A.V.R., Gajapathi Durga. P., "Evaluation of physic-chemical parameters of selected Aquaculture ponds water in Bhimavaram Mandal, W.G. District, A.P. State, India", Journal of Survey in Fisheries Science, 2023, 10(1),1291-1306.
49. Mishra, Y., "Physico-chemical Analysis of some major ponds in relation to fish production of district Kaushambi Uttar Pradesh", GSC Biological and Pharmaceutical Sciences, 2023, 23(1), 174-178.
50. Rani, S., Chandolia, L.S., Devi, P., Giri, A., "Seasonal Variation of Pond Water Productivity in A SemiArid Region Of India", Bulletin of Environment, Pharmacology and Life Sciences, 2023, 12, 49-52.
51. Shivashankar, P.B., Alavandi, S., "Analysis of Physico-Chemical Parameters of Water of Ponds/Lakes in and Around Arsikere Taluk, Hassan District, Karnataka, India", Asian Journal of Biological and Life Sciences, 2023, 12(3), 628-639.
52. Singh, R., Niranjan, S., Nagar, S., "Study of Physico-chemical Parameters on a Fresh Water Pond of Orai, U.P., India", Uttrapradesh Journal of Zoology, 2023, 44(10), 83- 93.
53. Singh, V., Chaurasia, U.P., "A Comparative study of three pond ecosystem for physico-chemical parameters in Kota Rajasthan", Global Research in Environment andSustainability, 2023, 1(1), 1-6