

WATER QUALITY AND DRINKING WATER POTENTIAL OF VELLAYANI AND POOKODE LAKES OF KERALA, INDIA

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ABSTRACT

Fresh water resources are the mirror's of nation's ecological wealth, playing vital roles in the hydrological, biological and biogeochemical aspects of the environment. But the fresh water resources are threatened by myriad of forces like unplanned development, overexploitation, pollution and various other environmental degradation issues. Maintaining purity of freshwater resources to the utmost level is of prime importance in meeting the new challenges of the modern society. Present work deals with the water quality assessment of Vellayani and Pookode Lakes, the two rain-fed fresh water ecosystems located in the different terrains of the state. Vellayani lake is situated in the outskirts of Thiruvananthapuram and are utilized for drinking needs of Kalliyoor-Venganoor-Vizhinjam-Kovalam Grama panchayats of Thiruvananthapuram District. Pookode Lake, a biodiversity hotspot in Western Ghats in Wayanad district is extensively used for tourism activities. Water samples were collected from different parts of the lakes and analysed for the physico-chemical parameters, such as Temperature, pH, Turbidity, Conductivity, Total Dissolved Solids, Total Suspended Solids, Dissolved Oxygen, Bio-chemical oxygen, Total alkalinity, and Total hardness, Calcium, Magnesium, Iron, Nitrates, Phosphates, Silicates and Iron. The observed average values of various physico-chemical parameters were compared with the standard of drinking water quality recommended by Bureau of Indian Standards. The results revealed that no significant variation is noted in various water quality parameters from the permissible ranges of BIS except slight deviation in pH and Turbidity values. There is an urgent need to initiate management measures for conservation of these pristine fresh water resources for the sustainable utilization.

Keywords: Fresh water Lakes, Physico-chemical parameters, Water quality standards

INTRODUCTION

Lakes act as vital and susceptible fresh water resources that have widely been utilized by mankind over the centuries. Lakes are degraded by both natural and anthropogenic activities, which deteriorate their quality, and push them to the brink of extinction in the process of unplanned development, giving rise to the need for suitable conservation strategies. The maintenance of healthy aquatic ecosystem is dependent on the physico-chemical properties and biological diversity (Venkatesharaju et al., 2010).

There is not much recent information regarding the drinking water status of the freshwater environment in

Kerala state for their proper maintenance and management or for their sustainable utilization. In this context, this study assess the impact of physico-chemical parameters on the lake waters of Vellayani and Pookode, two rain fed fresh water lakes in Kerala, South west India. The present status of the lake is briefly discussed in order to evolve strategies for increasing drinking water potential of the lakes through proper environmental management. Fig. 1 shows the two fresh water lakes lies in the eastern highland (Pookode lake) and in the western low land area (Vellayani lake).

Vellayani Lake, is located in the outskirts of Thiruvananthapuram City, lies between north latitude 8

Fig. 1.
Location Map of the study area
(After Veena M.P., 2014)

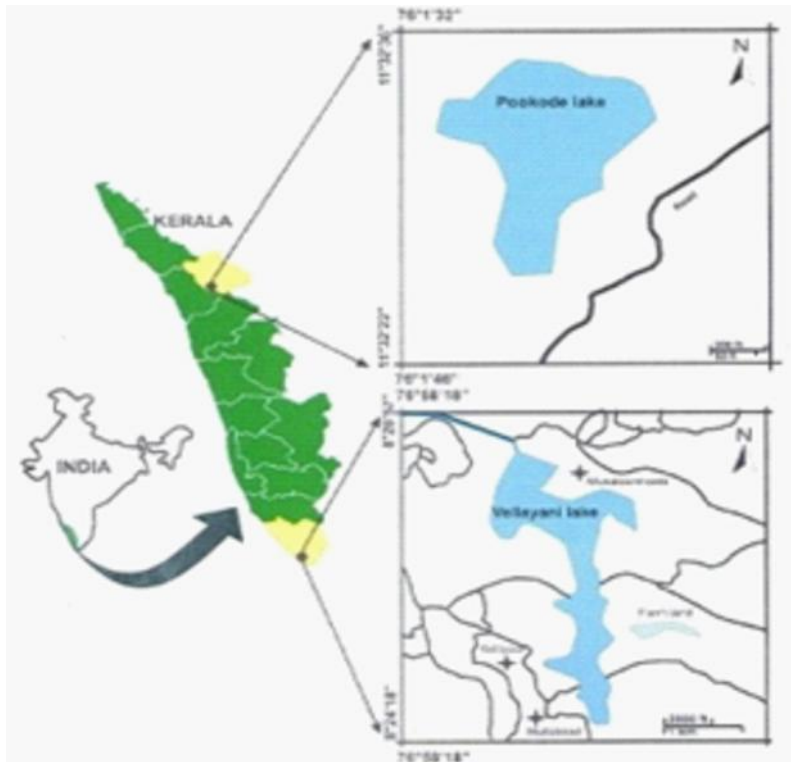


Table 1.
Comparative evaluation of the observed hydro-chemical values of the present study against Bureau of Indian Standards

Sl. No.	Parameter	BIS	Vellayani	Pookode
1	pH	6.5-8.5	5.02 -5.89	6.34 -6.61
2	Turbidity(NTU)	10	5.25-13.3	4.02-10.36
3	TDS(mg/l)	500	127.7-139.1	102.3-129.3
4	DO(mg/l)	6.5-8.5	6.03-8.5	4.03-6.99
5	Nitrates(mg/l)	45	3-5	1.2-1.9
6	Phosphates(mg/l)	-	0.96-1.66	0.087-0.66
7	Chlorides(mg/l)	200	10.05-14.52	9.05-10.90
8	sulphates(mg/l)	200	0.201-0.524	0.025-0.36
9	Hardness as CaCO_3 (mg/l)	200	20-60	20-40
10	Calcium(mg/l)	75	6.47-8.05	4.01-6.0
11	Magnesium(mg/l)	30	2.54-3.98	1.25-2.56

$^{\circ}24' 90''$ - $8^{\circ} 26' 30''$ and east longitude $76^{\circ} 59' 08''$ - $76^{\circ} 59' 47''$. Presently, the lake water is utilized for drinking needs of Kalliyoor - Venganoor - Vizhinjam - Kovalam Gramapanchayats of Thiruvananthapuram District under Rural Water Supply Scheme of Kerala Water Authority. Over the years, reports showed that the fresh water ecosystem is undergoing severe environmental degradation due to unscientific water extraction and discharge of pollutants from agricultural and urban sources. The artificial fish feeds used as a part of the integrated fish farming and the pesticide residues from the surrounding agricultural lands doing much havoc to the lake ecosystem. The lake is comparatively shallow with a depth varies from 2-6m. The water spread area of the Vellayani Lake is estimated to be about 5.5km². The lake receives runoff from urban and agricultural sources. It is oriented almost parallel to the coastal line and the northern portion of this lake is changed into a reservoir and used mainly for irrigation purposes. Water shed areas of the Vellayani Lake is utilized extensively for a variety of cultivation.

Pookode lake is an elliptical shaped fresh water basin, situated at a high elevated inter montane region (~770 amsl.) in Wayanad district, Kerala. The lake basin covers an area of 0.085 sq. km and the maximum water depth is 6.5 m. This Lake is extensively used for tourism activities.

Water samples of Vellayani and Pookode Lakes were collected during monsoon season in the month of June 2014. Well- cleaned plastic containers were taken for sample collection to test physico- chemical parameters. Utmost care was taken not to contaminate the samples during collection and preservation. The physico- chemical analysis of various parameters should be conducted by following the standard methods (APHA, 1998). The quality of lake waters has been assessed by

comparing each parameter with the standard desirable limit of that parameter in drinking water as prescribed by Bureau of Indian Standards (BIS).

The range of various physico-chemical parameters of the water resources of Vellayani Lake and Pookode Lake, such as TDS, Sulphates, Chlorides, Calcium, Magnesium and Hardness fall within the permissible limits prescribed by BIS.

The water samples remained slightly acidic in Vellayani and Pookode Lakes which ranged from 5.02 to 5.89 and 6.34 to 6.61 respectively. The PH range was found to be above the desirable limit of drinking water standards prescribed by BIS. The high values may be due to attributed domestic wastes from surrounding areas and agricultural fields. pH value is very important for Plankton growth and nutrient availability in such freshwater lakes (Chisty, 2002).

Turbidity, a measure of suspended particles in water ranged from 5.25-13.3 NTU in Vellayani and 4.02-10.36 NTU in Pookode Lake. The results supported by Dagaonkar and Saksena (1992) and Garg et al (2006) showed that high turbidity observing during monsoon season. During rainy season silt, clay and other suspended particles contribute to the turbidity values.

Dissolved oxygen is an important aquatic parameter, whose presence is vital to aquatic fauna. It plays crucial role in life processes of animals. DO values ranged from 6.03-8.05 mg/l in Vellayani Lake and the values ranged from 4.03-6.99 mg/l in Pookode Lake.

The nutrient content of water is an indication of the degree of sustainability of the system of primary production. At very high concentration of nutrients, eutrophication in water bodies may possible. Nitrate level ranges from 3-5 mg/l in Vellayani Lake and the nitrates level in Pookode ranges from 1.2-1.9 mg/l. The phosphate level exhibits a range from 0.96-1.66 mg/l in Vellayani Lake and 0.087-0.66 mg/l in Pookode Lake. The comparative evaluation of the present data against the previous values (Krishnakumar et al, 2006) indicate that the nutrient level is elevated in the system. This may be due to the higher phytoplanktonic production, decaying macrophytes and runoff from the agricultural catchments. Studies show that if similar conditions prevail in lake ecosystems like this, the oligotrophic condition will soon change to eutrophic condition (Agrawal And Rajwar, 2010).

CONCLUSION

The Vellayani and Pookode Lakes are the two important fresh water lakes in Kerala, as they have significantly

important for balancing the biogeochemical regime of the holding terrain. But indications show that human interventions and input of pollutants from agricultural and domestic sources are imparting much havoc to the Vellayani Lake. Comparatively, the Pookode Lake is not so polluted as it is situated in the highland region. But signs show that overexploitation by means of tourism activities may harm the Pookode Lake. The study highlights the need for effective conservation strategies to protect both these lake systems, for the present and future utilization needs as sources of drinking water.

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