

Correlation Study on Physico-Chemical Parameters of urban ponds, Thiruvananthapuram, Kerala

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Abstract: Present work deals with the assessment of Physico-chemical parameters of water samples of ten ponds connected to Neyyar river basin during pre-monsoon season and post monsoon season in 2012. Statistical studies have been carried out by calculating correlation coefficients between different pairs of parameters. The observed values of various physico-chemical parameters of water samples were compared with standard values recommended by BIS. It is found that a significant correlation holds for calcium with pH, magnesium, and dissolved oxygen (DO), TDS with calcium, magnesium and total hardness. A significant negative correlation was found between BOD with DO, calcium and magnesium. All the Physico-chemical parameters are within the acceptable limit set by BIS.

Key words: Physico-chemical parameters, correlation coefficients, Neyyar River.

Introduction

Knowledge of the chemical composition of water is necessary for urban areas of practical activity as water supply, irrigation, and domestic use. The study of the chemical composition of water becomes particularly important when combating the pollution of water basins by waste waters. Water quality conditions in a pond are controlled by both natural process and human influences. The chemistry of surface waters studies the chemical composition of waters in rivers, lakes and artificial reservoirs, changes in the composition with land or water area and with depth, seasonal diurnal variations, and the conditions of the determination of its composition in its dependence on the surrounding environment. It is of great importance to predict the chemical composition of water bodies built in urban regions. Since the selected sites are situated in the fringe of urban areas, the physical parameters reflect the influence of urbanization in surface water. Therefore, in recent years an alternative approach based on statistical correlation, has been used to develop mathematical relationship for comparison of Physico-chemical parameters [1-3].

The present study deals with study of Physico-chemical parameters of different urban ponds connected to Neyyar River. The analyzed data were compared with standard values recommended by BIS. Systematic calculation of correlation coefficient between water quality parameters has been done with the objective of minimizing the complexity and dimensionality of large set of data.

Materials and methods

Neyyar River flows through Thiruvananthapuram district. It originates from

Agastyarkoodam hills and then passes through Neyyatinkara. It then finally empties into the Arabian Sea. The river has a length of 56 kms. Ten ponds including Neyyar river basin water was analyzed during the study. The sites are 1. Neyyar River water (N/08°37',E/077°15') 2. Valiyakulam(N/08°31'483'',E/077°08'748''),3.Th opinkulam(N/08°29'081'',E/077°07'889''),4.Mypar ambukulam(N/08°28'916'',E/077°07'796''),5.Vatta kulam(N/08°23'183'',E/077°08'440''),6.Choodukul am(N/08°23'146'',E/077°08'679''),7.Ponnankulam(N/08°21'799'',E/077°08'246''),8.Thavalayillakula m(N/08°20'763'',E/077°09'025''),9.Puthukulam(N/08°20'239'',E/077°09'475''),10.Puliankulam(N/08°19'951'',E/077°09'744'').

Experimental analysis

Water samples were collected from sampling stations, nine ponds including Neyyar river water during pre-monsoon and post monsoon season in 2012. Analysis of Physico-chemical parameters like pH, Electrical Conductivity(EC),Total Dissolved Solids(TDS),Total Alkalinity(TA), Chloride, Total Hardness(TH), Dissolved Oxygen(DO) and Nitrate were analyzed as per procedure given by out by following standard analytical procedures of APHA (American Public Health Association) 2005.

The statistical analysis has been performed using standard methods [5]. Karl-Pearson correlation coefficient(r) was calculated using SPS software.

Results and Discussion

Different pair of correlation during pre-monsoon season and post monsoon season of experimental water samples are presented in Table 1 & 2. The observed values are within the

permissible limit prescribed by WHO [7]. Since no prescribed standards are suggested by WHO for Electrical Conductivity for drinking purpose. So, no comparison can be made from observed values.

Table 1. Different pair of correlation during pre-monsoon season (2012)

Parameters	Parameters	r
Turbidity	TDS	.679
	Alkalinity	.692
TDS	TH	.686
	Calcium	.639
	Magnesium	.808
Alkalinity	Chloride	.718
TH	Calcium	.767
	Magnesium	.710
Calcium	Magnesium	.874
	Dissolved oxygen	.646
	BOD	-.690
Dissolved oxygen	BOD	-.734

TDS-total dissolved solids, TH-total hardness, BOD-biochemical oxygen demand

Table 2. Different pair of correlation during post-monsoon season (2012)

Parameters	Parameters	r
EC	TH	-.704
	Turbidity	.639
TDS	Calcium	.680
Calcium	Magnesium	.927
	Dissolved oxygen	.659
	BOD	.759
Dissolved oxygen	Nitrate	.764

Electrical conductivity was correlated with alkalinity ($r=0.540$). Turbidity was correlated with TDS ($r=0.679$), alkalinity ($r=0.692$), magnesium ($r=0.617$) and copper ($r=0.586$). TDS shows correlation with TH ($r=0.686$), alkalinity ($r=0.528$), calcium ($r=0.639$), magnesium ($r=0.808$), manganese ($r=-0.597$), and copper ($r=0.703$). Alkalinity shows correlation with turbidity ($r=0.692$), magnesium ($r=0.509$), chloride ($r=0.718$) and copper ($r=0.694$). TH shows correlation with TDS ($r=0.686$), calcium ($r=0.767$), magnesium ($r=0.710$) and BOD ($r=-0.507$). Calcium shows correlation with TDS ($r=0.639$), magnesium ($r=0.874$), DO ($r=0.646$), BOD ($r=-0.690$) and iron ($r=-0.534$). Magnesium TDS ($r=0.808$), alkalinity ($r=0.509$), TH ($r=0.710$)

and calcium ($r=0.874$). DO shows correlation with calcium ($r=0.646$), BOD shows correlation with calcium ($r=-0.690$), DO ($r=-0.734$). Chloride shows correlation with alkalinity ($r=0.718$) and magnesium ($r=0.551$). Nitrate is correlated with turbidity ($r=-0.602$).

The results indicates that during post monsoon season (2012), the pH is correlated with EC ($r = 0.743$), Turbidity ($r = 0.512$), Ca ($r = 0.503$), Pb ($r = 0.718$), and Cd ($r = 0.0820$). EC is correlated with turbidity ($r = 0.0639$), Alkalinity ($r = 0.0539$), TH ($r = -0.704$) and Cd ($r = 0.610$). Turbidity is correlated with alkalinity ($r = 0.522$). TDS is correlated with Ca ($r = 0.680$). Alkalinity is correlated with TH ($r = -0.489$) and Mn ($r = -0.482$). TH is correlated with NO₃ ($r = -0.609$). Ca is correlated with Mg ($r = 0.927$), DO ($r = 0.459$), BOD ($r = -0.759$) Mg is correlated with BOD ($r = -0.664$) and Cl ($r = -0.580$).

Conclusion

All the physico-chemical parameters of different ponds are within the desirable limit set by BIS. A large number of components, geological conditions influence the correlation between different pairs directly or indirectly. A significant correlation have been recorded with magnesium, calcium dissolved oxygen and nitrate.

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