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CORRELATION ANALYSIS AND LINEAR REGRESSION OF WATER QUALITY IN PITKATI WETLAND, ASSAM, INDIA

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ABSTRACT

The present study deals with the study of water quality of Pitkati wetland, Assam, India for physic chemical parameters i.e, Dissolved oxygen (DO), Biological oxygen demand (BOD), Chemical oxygen demand (COD), Total hardness (TH), Total dissolved solids (TDS), Water temperature (WT) in the year 2014 for pre monsoon season . Low value of dissolved oxygen is observed during pre monsoon season and high values of COD, TDS, TH are observed..The correlation coefficient showed positive and negative relationships among the water quality parameters. Linear Regression equations of the parametrs are also evaluated. The study revealed that the wetland water is moderately polluted.

Key Words : Water Quality, Physico-chemical parameters, Correlation, Linear regression, Temperature

INTRODUCTION

The wetland actually consists of water throughout the year or in some particular seasons the water may recede. The freshwater, perennial , large, lentic waterbodies are commonly known as beels in Assam. The most important step for the conservation of wetland is to maintain a proper water quality. The water quality is directly related with the health of the wetland. The purpose of the present study is to observe water quality of Pitkati wetland by physico-chemical proce-dures and to find the relationship between various physico-chemical parameters .

Study Area

Pitkati wetland covers an area of about 40.16 hectares and the latitude and longitude are 26 °14'45.3" N to 26 ° 15'07'3" N and 91 ° 31'49" E to 91 ° 32'53.2 " E respectively

MATERIAL AND METHODS

Sampling sites and sampling

Nine sampling sites were selected. These sites were from the middle and two banks of the Pitkati wetland. Water samples were collected randomly in triplicate from the sites in 500 ml polythene bottles immersed about 20 cm below the surface of the water and filled up to the top sealed and tested in laboratory following standard analysis technique[1].

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Statistical Analysis

Calculation of Karl Pearson's coefficient of correlation

Correlation coefficient (r) using Karl Pearson's coefficient between each pair of physico-chemical water parameters .According to Karl Pearson, coefficient of correlation (r) between two parameters x and y is calculated as

$$r = \Sigma [(x-\bar{x}) (y-\bar{y})] / \sqrt{\Sigma (x-\bar{x})^2 \Sigma (y-\bar{y})^2}$$

Where $x = x-\bar{x}$, $y = y-\bar{y}$

If the value of correlation coefficient (r) between two variables x and y is large , it implies that these two variables are highly correlated.

Calculation of regression equation

The term regression stands for some sort of functional relationship between two or more related variables .It measures the nature and extent of correlation and predicts the unknown values of another variable.

$Y = a + bx$

Slope (b) of regression line

$b = r \sigma y / \sigma x$

Y = Intercept (a) of regression line :

$a = \bar{y} - b\bar{x}$

RESULTS AND DISCUSSION

The correlation coefficient shows the extent of association between two variables. The greater the value of correlation coefficient there exist a good relationship between the two variables. There exists direct relationship between two paramaters on increase or decrease of one parameter will change the parameter of the other variable[2].The values of water quality parameters in the form of table are shown in **Table 1.** The regression analysis was also carr-ied out to relate DO with BOD, BOD with COD, COD with TH, TDS with WT, BOD with TH, which give linear regression equation y = 0.1359x + 4.17, y= 0.3892x + 3.95, y= - 49.99x + 491.8, y = 0.0101x + 23.98, y = - 77.21x +565.6

The scatter diagram consisting water quality parameter values with linear regression equa-tion are shown in **Fig. 1** to **Fig. 5**.

The relationship between DO with BOD, BOD with COD, COD with TH, TDS with WT, BOD with TH is established which give correlation coefficient r =.13781, r = - .4294, r = - .7294, r =-.4280 r = .2978, respectively, showing a moderate relation. The correlation matrix table of the water quality parameters are shown in **Table 2.** In the Pitkati wetland, during the pre monsoon season the DO value is 3.1 mg/L which is lowest value. Highest value is 4.7 mg/L. BOD value was 5.5 mg/L as high value. The TDS and THS also showed high values i.e 345mg/L and 287.9 mg/L. WT showed highest in pre monsoon season is 30.2 degree celcious. COD highest value is 6.6 mg/L Deterioration of Indian water bodies due to industrial effluent discharge and domestic waste discharge has been reported by many researchers in the past few decades[3]. Variation in water temperature as important physical parameter has been studied[4].The BOD test measures the amount of oxygen consumed by micro organasims to degrade the organic matter. Decrease in DO results high value of BOD because oxygen is consumed by aerobic bacteria that make the aquatic life survival difficult. The COD test measures the amount of oxygen required by organic and inorganic compounds .High COD indicates decrease in DO in water bodies. Lower and higher temperatures in water yields different primary productivity in aquatic ecosystems[5,6]. High Temperature indicates low DO. Many research have shown that the water pollution heavily affects the human life, in developing countries like India, with many ill health conditions and premature mortality[7,9]. The increased algal bloom or growth depletes the dissolved oxygen level in aquatic waterbodies[12-16] .

The concentration of dissolved oxygen directly depends on the area of air exposed and inversely proportional to the water temperatures[13,14]. During the summer season the hardness is generally increased[17-28].

Table 1 : Water quality parameters in mg/L at Pitkati wetland

BOD	DO	COD	TDS	TH	WT
4.3	3.9	6.29	332	214.7	30.2
5.1	4.3	5.7	221	236.8	25.7
4.0	3.8	5.2	345	219.8	23.9
5.5	3.1	6.6	90	105.8	20.7
5.1	4.7	5.3	267	151.8	27.6
4.2	3.2	5.6	118	287.9	29.7

Table 2 : Correlation coefficient matrix for water quality parameters of Pitkati wetland in pre monsoon

	BOD	DO	COD	TDS	TH	WT
BOD	1					
DO	0.137823	1				
COD	0.428048	-0.51725	1			
TDS	-0.50917	0.617877	-0.42592	1		
TH	-0.72945	-0.05444	-0.42948	0.145517	1	
WT	-0.52191	0.27955	-0.23821	0.297834	0.641049	1

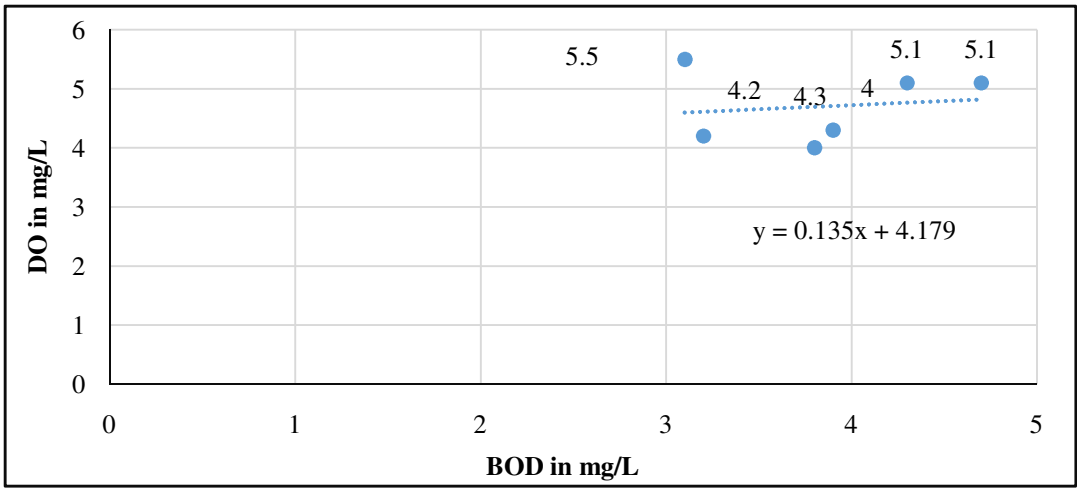

Fig. 1 : Scatter diagram between DO and BOD

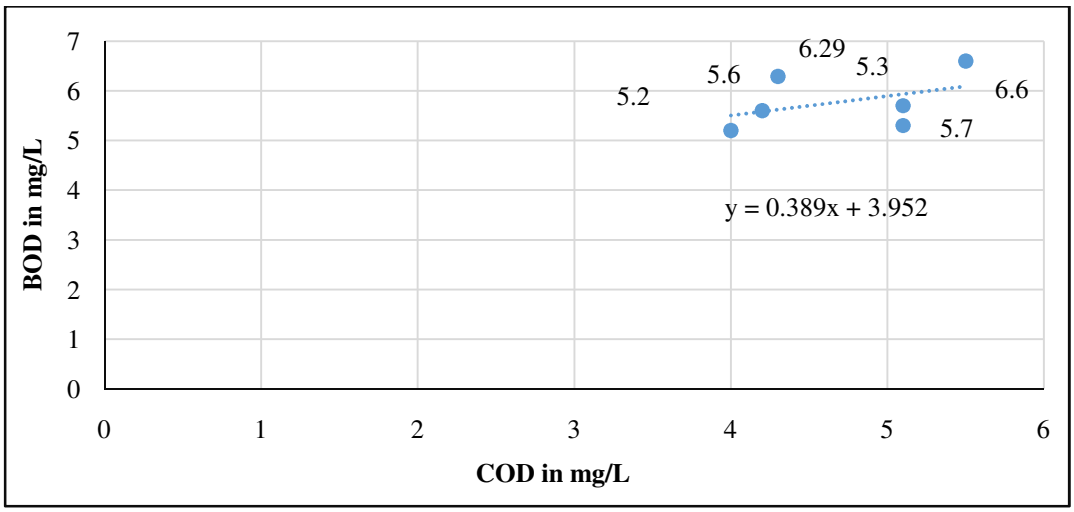

Fig. 2 : Scatter diagram between BOD and COD

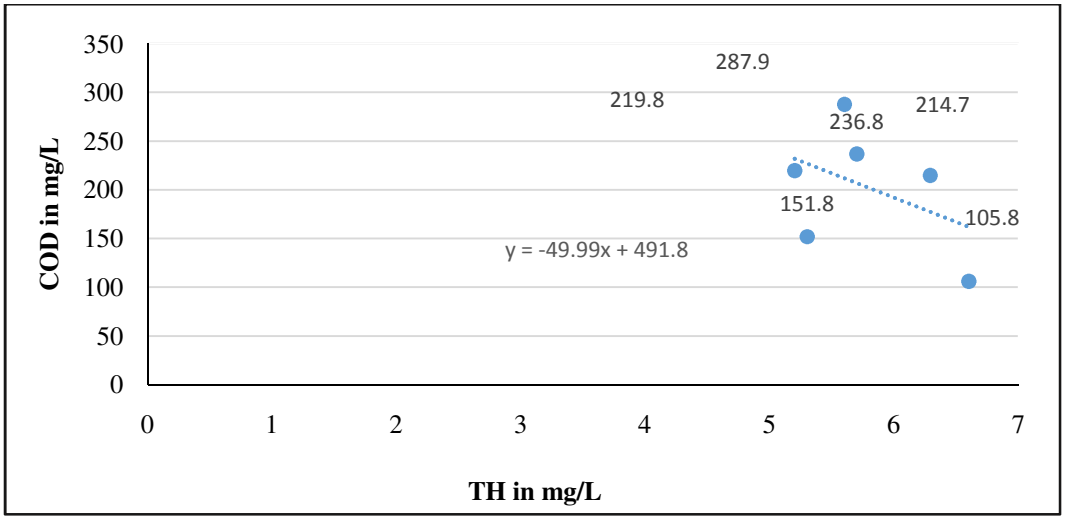

Fig. 3 : Scatter diagram between COD and TH

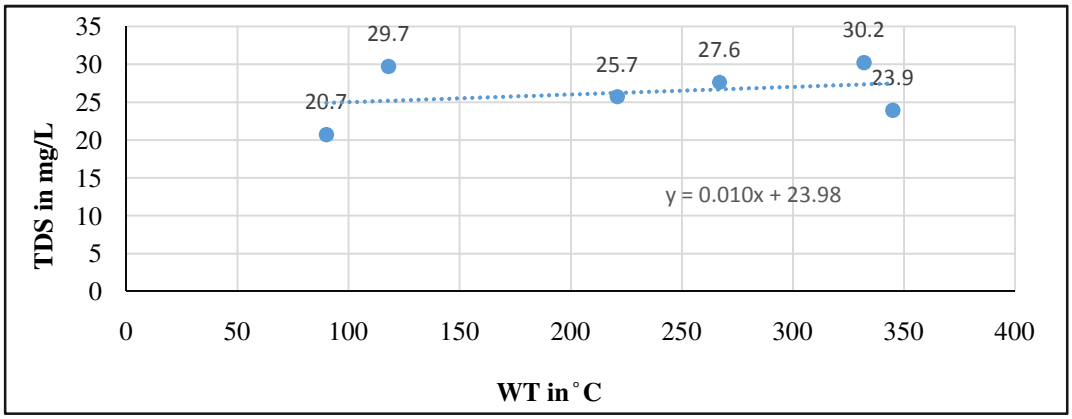

Fig. 4 : Scatter diagram between TDS and WT

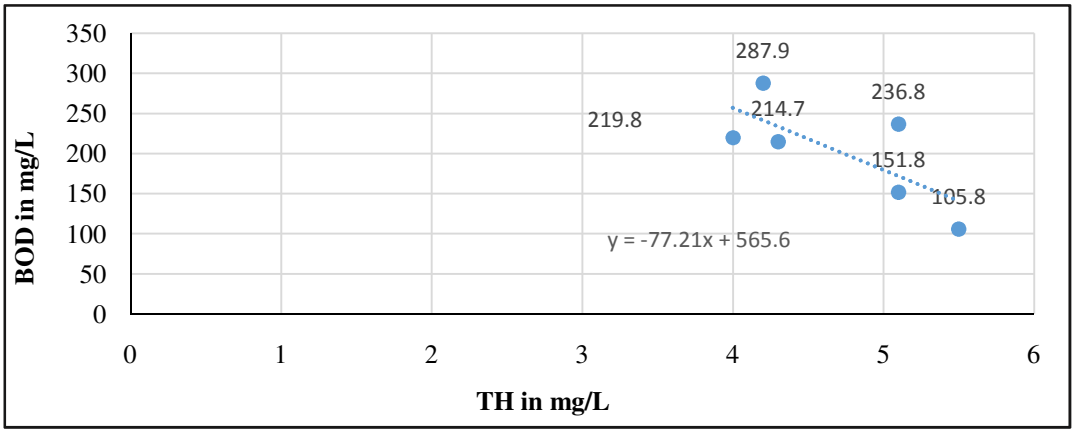

Fig. 5 : Scatter diagram between BOD and TH

CONCLUSION

Regression equations are very useful for establishing some good correlations between physico chemical water parameters and these equations on the other hand are useful for determining contamination in water bodies. In the present study, we have established six correlation coefficient, alongwith regression equation for the estimation of DO, BOD, COD, BOD, TH, TDS, WT. The above analysis is very useful as well as cost effective method to get accurate idea of quality of waterbodies and to know about the status of the wetlands.

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