

Kerl Pearson's coefficients of correlation for Physico-chemical parameters of Drinking water quality in and around the Kada Village

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Abstract

The present paper deals with to evaluate Kerl Pearson's coefficients of correlation for the physico-chemical parameters of drinking water collected from Kada Village of Beed district. Water samples were collected from five sampling sites in and around the Kada. All the correlations indicate that different parameters are strongly interrelated to each other. A correlation coefficient provides an excellent tool for calculating of various water quality parameters.

KEYWORDS : Covariance, correlation coefficients, Drinking water, Physico-chemical parameters.

Introduction:

In the recent years an increasing threat to drinking water quality due to human activities has become of great importance. The quality ground water varies from place to place, with the depth of water level and from season to season. In recent years an alternative based on statistical correlation has been used to develop mathematical relationship for comparison of Physico-chemical parameters.

Mathematics in environmental science provides more alternative studies; through it deviates from real situation. Correlation coefficient of underground water has been carried out between various parameters of ground water.

The present study deals with study of systematic calculation of correlation coefficients between drinking water quality parameters in have been done with the objective of large set of data. The statistical analysis has been performed using standard methods (i) Scatter Diagram (graphical method) and (ii) Kerl Pearson's correlation coefficients was calculated.

The joint relation between two variables is called correlation. e.g. the amount of electricity used and amount of bill, the age of husband and age of wife, intelligence quotient and marks in the test of student, volume and pressure of gas, Height of a place from sea level and amount of oxygen present in the air, etc.

Thus two variables are said to be correlated if change in one variable causes corresponding change in the value of other variable. The correlation can be of two types (positive and negative).Methods of studying the correlation between two variables are(i)Scatter Diagram(graphical method) (ii) Kerl Pearson's coefficients of correlation(algebraic method).

Material and methods:

Study area:

Kada is well known big village in Ashti taluka situated in Marathwada region of Maharashtra having a big market. The graphical co-ordinates of the Kada village

18⁰54'0"North and 75⁰6'0"East and height is 552 m above sea level. There are two lakes near the town i.e. Nimbodi and Nimgaon Chobha lakes. This is situated on the "Kadi" river. Nimbodi lake is 4km. away from Kada and Nimgaon Chobha lake is 3 km. away from Kada.

Sample Collection and Analysis:

The five sampling sites were selected i.e. S₁ – Bore Well -Anand colony, S₂- Bore Well -Bhawani nagar S₃- Bore Well -Near Bus Stand, S₄- Hand pump -Market Yard and S₅- Tap water - Gram Panchyat water supply. The distance between the sites is about one km from each other. The samples were collected in well sterilized plastic cans of 5 liters capacity with a tight lid. The water sample were selected for the physic-chemical analysis of five drinking water parameters such as Temp., potential hydrogen(pH),dissolved oxygen(DO), calcium and chlorides .Afterword the analyzed water parameters were compared with World health Organization(WHO) and Indian Standard Institute(ISI).

After collecting samples immediately the physical parameters such as temp. and pH were recorded by using portable kit and thermometer. Also the chemical parameters such as DO was fixed on the site by using magnesium Sulphate and alkaline potassium iodide solution and calcium and chloride were analyzed in laboratory. The average values of parameters at each site are summarized in table no.1

Table 1: Average values of Physico-chemical parameters of Kada Village

Sr. No.	Site	Physical parameters		Chemical Parameters		
		Temp.	pH	DO	Calcium	Chloride
1	S ₁	26.6	7.8	3.4	28	28.4
2	S ₂	27.1	7.2	3.2	35	70.3
3	S ₃	28.1	8	4	40	430
4	S ₄	29.4	7.2	3.5	59.9	200
5	S ₅	22	8.2	6.5	15.5	25.5

Statistical Analysis: All the data obtained subjected to statistical analysis. In statistical analysis, a correlation developed between parameters by using Scatter diagram and Kerl Pearson’s coefficient of correlation.

Calculation of Kerl Pearson’s coefficient of correlation:

Correlation coefficient (r) calculated using Kerl Pearson’s coefficients between each pair of water quality physic-chemical parameters in the present study and (x_i, y_i) be n pairs of observed value of these variables.(i= 1,2,3,---,n).Then the correlation coefficient between the variables x and y is given by,

$$r = \text{Corr} (x, y) = \frac{\text{Cov} (x,y)}{\sigma_x \sigma_y} = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{[n\sum x_i^2 - (\sum x_i)^2][n\sum y_i^2 - (\sum y_i)^2]}}$$

Where the summation is taken over 1 to n (n= Number of observations i.e. number of samples).

Table 2: Average values of correlation coefficient of Drinking water samples in different sites in Kada Village.

Sr. No.	Parameters	Calculated value of r	Observation
1	Temp.(⁰ C) & pH	-0.000854	Negative correlation
2	Temp.(⁰ C) & Do (mg/l)	-0.00607	Negative correlation
3	Calcium (mg/l) & Chloride (mg/l)	0.055009	Positive correlation

Results and Discussion:

The correlation coefficients shows the extent of association exists between two variables. The greater value of coefficient indicates a good relationship between two parameters. There is a direct relationship exists between two parameters on decrease or increase of one parameter the other will also change. There are some properties of correlation coefficients(r) defined are as follows:

- (i) If $r = 1$ there is perfect positive correlation between two variables.
- (ii) If $r = -1$ there is perfect negative correlation between two variables.
- (iii) If $r = 0$ there is no relation between two variables.
- (iv) If $r > 0$ there is positive correlation between two variables.
- (v) If $r < 0$ there is negative correlation between two variables.
- (vi) If $|r| > 0.8$ there is high correlation between two variables.
- (vii) If $0.3 < |r| < 0.8$ there is moderate correlation between two variables.
- (viii) If $|r| < 0.3$ there is marginal correlation between two variables.

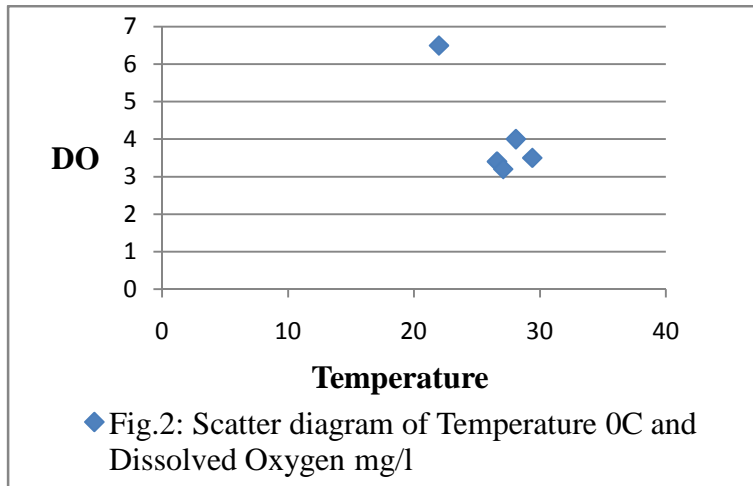
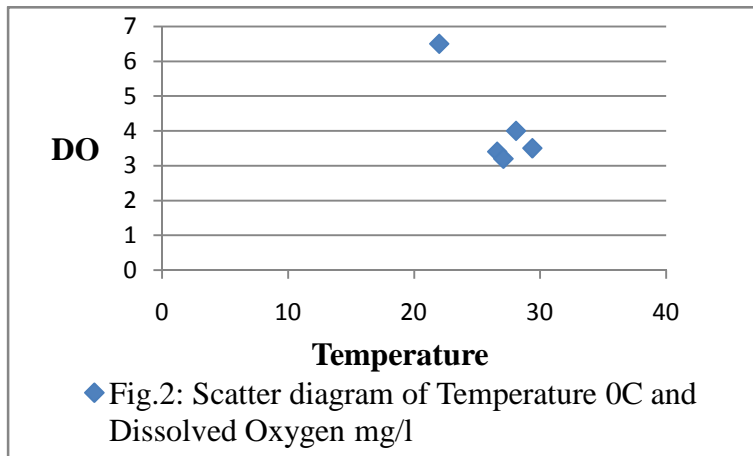
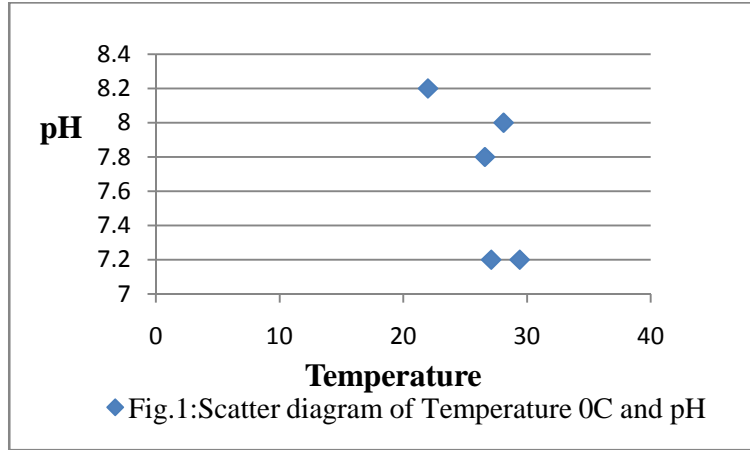
The relationships between the parameters in the form of Scatter diagrams are given in fig 1-3.

The relationship between physical parameters temp. with pH, physical parameter temp. with chemical parameter DO and chemical parameters calcium with chloride is established which give correlation coefficient $r = -0.000854$, $r = -0.00607$ and $r = 0.055009$ respectively, showing a very good correlation.

(i) The correlation coefficient between two physical parameters temp. and pH is $r = -0.000854$. Hence there is negative correlation and $|r| = 0.000854 < 0.3$ then the correlation is marginal.

(ii) The correlation coefficient between physical parameters temp. and chemical parameter DO is $r = -0.00607$. Hence there is negative correlation and $|r| = 0.00607 < 0.3$ then the correlation is marginal.

(iii) The correlation coefficient between chemical parameters calcium and chloride is $r = 0.055009$. Hence there is positive correlation and $|r| = 0.055009 < 0.3$ then the correlation is marginal.



Conclusion:

In the present study there is only one positive correlation coefficient between the chemical parameters only out of three correlation coefficient were observed. Hence the present investigation reveal that the impact of pollution found in the water quality of ground water and it is observed that quality of water is slightly deteriorated and the quality of water of the respective sites is not potable in some instant.

During the present investigation it is also observed that there is an impact of ground water and surface water on the socio-economic status of local peoples.

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