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RESEARCH ARTICLE

Analysis of Chloride Content in the Surface of Water Using Two Way ANOVA

Salahuddin[*1], Khola RK[1]

[1*]*Mewar University, Gangrar, Chittorgarh (Rajasthan), India.*

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ABSTRACT

This research paper is the extension of earlier work carried out by Chaudhary et. al. In this paper we analyse the data by statistical tool two way anova. After analysis we conclude that Chloride content in the surface of water at different locations of upper lake in Madhya Pradesh changes according to locations only. It means at different locations the Chloride content is different. But it never changes according to months.

KEYWORDS

Chloride, Analysis of variance, Graphical representation.

INTRODUCTION

Chloride

The chloride ion is formed when the element chlorine, a halogen, gains an electron to form an anion (negatively charged ion) Cl^-. The salts of hydrochloric acid contain chloride ions and can also be called chlorides. The chloride ions, and its salts such as sodium chloride, are very soluble in water. It is an essential electrolyte located in all body fluids responsible for maintaining acid/base balance, transmitting nerve impulses and regulating fluid in and out of cells.

The presence of chlorides, e.g. in seawater, significantly aggravates the conditions for pitting corrosion of most metals (including stainless steels and high-alloyed materials) by enhancing the formation and growth of the pits through an autocatalytic process.

***Address for Correspondence:**
Salahuddin
Mewar University,
Gangrar, Chittorgarh (Rajasthan),
India.
E-Mail Id: vsludn@gmail.com

Chloride is used to form salts that can preserve food such as sodium chloride. Other salts such as calcium chloride, magnesium chloride, potassium chloride have varied uses ranging from medical treatments to cement formation.

ANOVA is defines as

ANOVA is a statistical tool used in several ways to develop and confirm an explanation for the observed data. It is an extension of the t-test, which is used in determining the non-significance of difference of three or more group of values. In practice, there are several types of ANOVA depending on the number of treatments and the way they are applied to the subject in the experiment.

(i) One way ANOVA

(ii) Two way ANOVA

(iii) Factorial ANOVA

(iv) Mixed design ANOVA

(v) Multivariate analysis of variance (MANOVA)

The calculations of ANOVA can be characterized as computing a number of means and variances, dividing two variances and comparing the ratio to a handbook value to determine statistical significance.

The F-test is used for comparisons of the components of the total deviation. For example, in one-way or single factor ANOVA, statistical significance is tested for by comparing the F test statistic

F=Variance between samples/ Variance within samples.

The textbook method of concluding the hypothesis test is to compare the observed value of F with the critical value of F determined from tables. The critical value of F is a function of the numerator degrees of freedom, the denominator degrees of freedom and the significance level (α). If $F \geq F_{Critical}$ (Numerator DF, Denominator DF, α) then reject the null hypothesis.

Main Data of the Samples (After Laboratory Analysis)

Table 1: Presence of Chloride content in water at different locations of upper lake in Madhyapradesh (Laboratory Analysis) Units: mg/l

Area Names / **Month Names**	**Kolan**	**Betha**	**Bairgarh**	**Khanugau**	**Karbala**	**Kamla Park**
January	12.99	12.99	16.98	13.99	12.99	12.99
February	14.99	13.99	12.99	14.99	15.98	14.99
March	13.99	13.99	12.99	13.99	14.99	13.99
April	16.98	13.99	14.99	12.99	14.99	17.98
May	21.98	14.99	19.98	25.97	15.98	16.98
June	21.98	23.98	24.98	19.98	18.98	17.98
July	23.98	21.98	25.97	19.98	18.98	18.98
August	22.98	19.98	23.98	17.98	19.98	15.98
September	19.98	21.98	25.97	24.98	29.97	16.98
October	23.0	22.0	20.0	20.0	20.0	16.0
November	20.98	20.98	18.98	18.98	18.98	17.98
December	19.0	20.0	16.0	21.0	20.0	18.0
Total	232.83	220.85	233.81	224.83	221.82	198.83

Graphical Representation of the Data

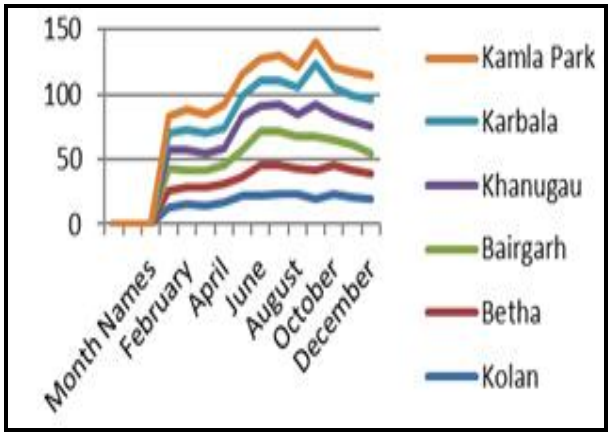

Figure 1: Line graph representation of Chloride

Now we have analysis the data by using statistical tool two way anova to get the result. That is whether the content of Chloride depends on locations and months or not.

Analysis the Data using Two Way ANOVA

Sources of value	Sum of squares	Degrees of freedom	Mean square (variance)
Between Areas	692.5459	11	62.95872
Between months	66.90174	5	13.38035
Residual	342.429	55	6.225981
Total	1101.877	71	---

Let us take the Hypothesis that there is no significance difference of Chloride content between the areas and months.

First we compare the variance of areas with the variance of residual.

F_1= 10.11226.

The table value of F for υ_1=11 and υ_2=55 at 5% level of significance is 1.967547.

The calculated value is greater than table value and we conclude that the Chloride content of different areas differ significantly. That is Chloride content at different area is different. That is Chloride content depends on areas that is locations.

Now, let us compare the variance according to months with the variance of residuals.

F_2= 2.149115

The table value of F for υ_3=5 and υ_2=55 at 5% level of significance is 2.382823

The calculated value is less than table value and we conclude that Chloride content of different areas does not depend on months.

CONCLUSION

It is concluded that the Chloride content at surface of upper lake water in different locations in Madhya Pradesh depends only location and it does not depend on Months.

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