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Analysis of COD in water at different locations of upper lake in Madhya Pradesh

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ABSTRACT

In this paper we collect the sample of water at different locations in Madhyapradesh and experiment the data in laboratory for the presence of COD. After that we use the statistical methods. We represent the data graphically. Then we analysis the data to get the decision and establish the result that there is no significant different between the samples of various area.

Key Words and Phrases: COD ; Analysis of variance ; Graphical representation. **2010 MSC NO:** 62J10,62H86,62P12.

INTRODUCTION

Chemical Oxygen demand is defined as

In environmental chemistry, the chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers) or wastewater, making COD a useful measure of water quality. It is expressed in milligrams per liter (mg/L) also referred to as ppm (parts per million), which indicates the mass of oxygen consumed per liter of solution.

ANOVA is defines as

ANOVA is a statistical tool used in several ways to develop and confirm an explanation for the observed data.

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.

I. Main Data of the samples(After Laboratory analysis)

Presence of COD in water at different locations of upper lake in Madhyapradesh (Laboratory Analysis) Units: mg/l

Area Names	Kolan	Bhori	Betha	Bairgarh	Bairgarh East	Khanugau
Month Names				_	_	_
January	48	56	40	48	56	56
February	12	16	16	20	12	36
March	24	28	20	32	24	20
April	40	36	44	32	28	36
May	16	08	12	16	12	20
June	16	12	20	08	20	16
July	14	10	20	12	18	14
August	28	32	24	28	32	28
September	24	32	28	16	20	28
October	20	16	12	16	20	12
November	08	16	12	08	04	08
December	20	24	12	20	16	20

II. Graphical representation of the data



Fig: Clustered Bar representation of COD

Now we have analysis the data by using statistical tool anova that is analysis of variance. We have analysis two way anova to conclude that if there is any significant difference between the samples or not.

III. Analysis the Data using two way Anova

Data in code form

Area Names	Kolan	Bhori	Betha	Bairgarh	Bairgarh East	Khanugau	Total
Month Names				_	_	_	
January	28	36	20	28	36	36	184
February	-8	-4	-4	0	-8	16	-8
March	4	8	0	12	4	0	28
April	20	16	24	12	8	16	96
May	-4	-12	-8	-4	-8	0	-36
June	-4	-8	0	-12	0	-4	-28
July	-6	-10	0	-8	-2	-6	-32
August	8	12	4	8	12	8	52
September	4	12	8	-4	0	8	28
October	0	-4	-8	-4	0	-8	-24
November	-12	-4	-8	-12	-16	-12	-64
December	0	4	-8	0	-4	0	0
Total	-30	46	20	16	30	54	196(Grand Total)

Correction Factor =
$$\frac{T}{N} = \frac{4802}{9}$$
, Grand Total= T=196.
Sum of squares between areas= $\frac{22464 - 19208}{36} = 90.467$ (approx.).

Sum of squares between months= $\frac{165552 - 9604}{18} = 8663.778$ (approx.).

Total sum ofsquares

 $= 78464 + 16 + 400 + 16 + 16 + 36 + 64 + 16 + 0 + 144 + \dots + 64 + 16 + 64 + 64 + \dots + 64 + 144 - T^{2} / N = 10288.444 (approx.).$

Sources of value	Sum of squares	Degrees of freedom	Mean square(variance)
Between Area	90.467	5	18.09
Between month	8663.778	11	787.62
Residual	1534.199	55	27.90
Total	10288.444	71	

Let us take the Hypothesis that there is no signaficance difference of COD between the areas and months. First we compare the variance of areas with the variance of residual.

$$F = \frac{18.09}{27.90} = 0.6484.$$

The table value of F for v_1 =5 and v_2 =55 at 5% level of significance is 2.38.

The calculated value is less than table value and we conclude that the COD of different areas do not differ significantly.

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

$$F = \frac{787.62}{27.90} = 28.23$$

The table value of F for $v_3=11$ and $v_2=55$ at 5% level of significance is 2.55.

The calculated value is greater than table value . So the COD of different areas changes according to months.

CONCLUSION

It is concluded that the COD does not depend on areas but it depends on months. That is COD changes according to months.

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