5/12/2022

EXPERIMENT → 11

AIM:

EXPERIMENT:

- The average no. of days by mice inoculated with 5 strains of typhoid organisms along with their S.D & no. of mice involved in each experiment is given below on the basis of this data what will be your conclusion regarding the strains of typhoid organism.

Strains of typoid	A	B	C	D	E
No. of mice (n_i)	10	6	8	11	5
Averge ($\bar{y}_i$)	10.9	13.5	11.5	11.2	15.4
S.D (s_i)	12.77	5.96	3.24	5.64	3.64

THEORY:-

* The ANOVA table is given by

Source of Variation	Sum of squares	Degrees of freedom	Mean sum of squares	Variance Ratio (F)
Treatment error	S.S.T S.S.E	K-1 N-K	(S.S.T)/K-1 = MST (S.S.E)/N-K = MSE	$F = \frac{MST}{MSE} \sim F_{(K-1, N-K)}$ if MST > MSE
Total	TSS	N-1		

where,

S.S.T = Sum of square due to treatment
S.S.E = Sum of square due to error
TSS = Total sum of square
MST = Mean sum of square due to treatment
MSE = Mean sum of square due to error.

Now,

$$\bar{y}_{i\cdot} = \frac{T_i}{n_i} \Rightarrow T_i = n_i \cdot \bar{y}_{i\cdot}$$

$$s_i^2 = \frac{1}{n_i} \sum_{j=1}^{n_i} y_{ij}^2 - (\bar{y}_{i\cdot})^2$$

$$= \sum_{j=1}^{n_i} y_{ij}^2 = n_i(s_i^2 + \bar{y}_{i\cdot}^2)$$

Also, C.F (Correction Factor) = $\frac{G^2}{N}$

where, G = Grand Total

$R.S.S = \sum_j \sum_i y_{ij}^2 = \sum_i n_i (s_i^2 + \bar{y}_{i.})^2$

Thus, $T.S.S = R.S.S - CF$

$S.S.T = \sum_i \frac{T_i^2}{n_i} - C.F$

$\therefore$ $S.S.E = T.S.S - S.S.T$

CALCULATION:

Here, the null hypothesis, $H_0 = \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
i.e., H_0 : different strains of typhoid organisms are homogeneous.

against H_1 : Atleast two of the means are different

Let, $T_{i.}$ be the total the i^{th} strain of typhoid & $G = \sum_i T_i$ = Be the grand total,

then,

$T_{i.} = n_i \bar{y}_{i.}$

$T_A = 10 \times 10.9 = 109$
$T_C = 8 \times 11.5 = 9.2$
$T_B = 6 \times 13.5 = 81$
$T_D = 11 \times 11.2 = 123.2$
$T_E = 5 \times 15.4 = 77$

$G = \sum_i T_i = (109 + 81 + 92 + 123.2 + 77) = 482.2$

$C.F = \frac{G^2}{N} = \frac{(482.2)^2}{40} = 5812.922$

$\sum_{j=1}^{n} y_{ij}^2 = n_i (s_i^2 + \bar{y}_{i.}^2)$ [where i = 1 to 5]
$= 10((12.75)^2 + (10.9)^2) + 6(5.96^2 + 13.5^2) + 8(3.24^2 + 11.5^2)$
$+ 11(5.65^2 + 11.2^2) + 5(3.64^2 + 15.4^2)$

$R.S.S = 8237.7299$

$T.S.S = RSS - CF = 8237.7299 - 5812.921$
$= 2424.8089$

$$S.S.T = \sum_i \frac{T_i^2}{n_i} - C.F$$

$$= \left[\frac{(109)^2}{10.9} + \frac{(81)^2}{6} + \frac{(92)^2}{8} + \frac{(123.2)^2}{11} + \frac{(77)^2}{5} \right] - 5812.91$$

$$= 92.313$$

$$S.S.E = T.S.S - S.S.T$$
$$= 2424.8089 - 92.313$$
$$= 2332.4959$$

ANOVA Table

Source of Variation	Sum of Squares	Degrees of Freedom	Mean sum of square	Variance Ratio (F)
Treatment	92.313	5-1=4	$MST = \frac{92.313}{4} = 23.07825$	$F = \frac{MSE}{MST} = \frac{66.64274}{23.07825} = 2.8876 \sim F_{(4,35)}$
Error	2332.4959	40-5=35	$MSE = \frac{2332.4959}{35} = 66.64274$	
Total	2424.8089	40-1=39		

RESULT:

The tabulated value of $F_{(4,35)} = 2.65$

Since, Cal F > Tab $F_{(4,35)}$

Therefore we may reject the null hypothesis at 5% level of significance i.e., atleast two of the means are different.