



SNS College of Technology

(An Autonomous Institution)

Coimbatore - 35



DEPARTMENT OF MATHEMATICS

UNIT - V DESIGN OF EXPERIMENTS

RANDOMISED BLOCK DESIGN (RBD) (or) TWO WAY CLASSIFICATION

Three varieties A, B, C, of a crop are tested in a randomized block design with four replications. The plot yields in pounds are as follows:

A	6	C	5	A	8	B	7
C	8	A	4	B	6	C	9
B	7	B	6	C	10	A	6

Analysis: The experimental yield and state your conclusion.

Soln:

Varities	Yields
A	6 4 8 6
B	7 6 6 9
C	8 5 10 9

	n_1	n_2	n_3	n_4	Total	n_1^2	n_2^2	n_3^2	n_4^2
y_1	6	4	8	6	24 Σy_1	36	16	64	36
y_2	7	6	6	9	28 Σy_2	49	36	36	81
y_3	8	5	10	9	32 Σy_3	64	25	100	81
	Σn_1	Σn_2	Σn_3	Σn_4	Σy_i	Σn_1^2	Σn_2^2	Σn_3^2	Σn_4^2
	21	15	24	24	84 Σy_i	149	77	200	198

step 1: Formulating H_0 and H_1

H_0 : There is no significant difference between yields and varieties

H_1 : There is significant difference between yields and varieties.



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Step 2: To find N & T

$$N = n_1 + n_2 + n_3 + n_4 \\ = 3 + 3 + 3 + 3 = 12$$

$$T = \sum x_1 + \sum x_2 + \sum x_3 + \sum x_4 \\ = 21 + 15 + 24 + 24 \\ = 84$$

Step 3: Correction factor, $C.F.$

$$C.F. = \frac{T^2}{N} = \frac{84^2}{12} = 588$$

Step 4: $TSS = \sum n_1^2 + \sum n_2^2 + \sum n_3^2 + \sum n_4^2 - C.F.$

$$= 149 + 77 + 200 + 198 - 588 \\ = 36$$

Step 5: $SSC = \frac{(\sum x_1)^2}{n_1} + \frac{(\sum x_2)^2}{n_2} + \frac{(\sum x_3)^2}{n_3} + \frac{(\sum x_4)^2}{n_4} - C.F.$

$$= \frac{21^2}{3} + \frac{15^2}{3} + \frac{24^2}{3} + \frac{24^2}{3} - 588 \\ = 18$$

$$SSR = \frac{(\sum y_1)^2}{n_1'} + \frac{(\sum y_2)^2}{n_2'} + \frac{(\sum y_3)^2}{n_3'} - C.F.$$
$$= \frac{24^2}{4} + \frac{28^2}{4} + \frac{32^2}{4} - 588 \\ = 8$$

Step 6: $SSE = TSS - SSC - SSR$

$$= 36 - 18 - 8 \\ = 10$$



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Step 7: Anova table.

Source of Variation	Sum of squares	Degrees of freedom	mean sum of squares	F-Ratio
Column	SSC: 18	$c-1: 4-1 = 3$	$MSC: 18/3 = 6$	$F_c = \frac{6}{1.6} = 3.75$ $F_{\alpha}(3,6) = 4.76$
Row	SSR: 8	$r-1: 3-1 = 2$	$MSR = 8/2 = 4$	$F_R = \frac{4}{1.6} = 2.5$
Error	SSE: 10	$(c-1)(r-1): 3 \times 2 = 6$	$MSE = 10/6 = 1.6$	$F_{\alpha}(2,6) = 5.14$

Step 8: Conclusion:

$$F_c = 3.75 < 4.76 = F_{\alpha}, H_0 \text{ is accepted}$$

$$F_R = 2.5 < 5.14 = F_{\alpha}, H_0 \text{ is accepted}$$

(a) There is no significant difference between yields & varieties.