



# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

AN AUTONOMOUS INSTITUTION



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## Topic: 2.10 – Latin Square Design

1. A variable trial was conducted on wheat with four varieties with Latin Square design. The plan of the experiment and the yield per plot are given below. Analyse the data and interpret the result.

C <sub>25</sub>	B	A	D
	23	20	20
A <sub>19</sub>	D <sub>19</sub>	C <sub>21</sub>	B <sub>18</sub>
B <sub>19</sub>	A <sub>14</sub>	D <sub>17</sub>	C <sub>20</sub>
D <sub>17</sub>	C <sub>20</sub>	B <sub>21</sub>	A <sub>15</sub>

Shifting the origin to 20

	$x_1$	$x_2$	$x_3$	$x_4$		$y_1^2$	$y_2^2$	$y_3^2$	$y_4^2$	
$y_1$	5	3	0	0	8	25	9	0	0	34
$y_2$	-1	-1	1	-2	-3	1	1	1	4	7
$y_3$	-1	-6	-3	0	-10	1	36	9	0	46
$y_4$	-3	0	1	-5	-7	9	0	1	25	35
	0	-4	-1	-7	-12	36	46	11	29	



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

$$T = -12 \quad N = 16$$
$$C.F = \frac{T^2}{N} = \frac{(-12)^2}{16} = \frac{144}{16} = 9$$

For  $\Rightarrow$   $x_1^2 \quad x_2^2 \quad x_3^2 \quad x_4^2$

$$TSS = \sum x_1^2 + \sum x_2^2 + \sum x_3^2 + \sum x_4^2 - \frac{T^2}{N}$$
$$= 36 + 46 + 11 + 29 - 9$$
$$= 113$$

$$SSC = \frac{(\sum x_1)^2}{N_1} + \frac{(\sum x_2)^2}{N_2} + \frac{(\sum x_3)^2}{N_3} + \frac{(\sum x_4)^2}{N_4} - \frac{T^2}{N}$$
$$= \frac{100^2}{4} + \frac{(-4)^2}{4} + \frac{(-1)^2}{4} + \frac{(-7)^2}{4} - 9$$
$$= 0 + 4 + 0.25 + 12.25 - 9$$
$$SSC = 7.5$$



# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

AN AUTONOMOUS INSTITUTION



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

$$\begin{aligned}SSR &= \frac{(\sum Y_1)^2}{N_2} + \frac{(\sum Y_2)^2}{N_2} + \frac{(\sum Y_3)^2}{N_2} + \frac{(\sum Y_4)^2}{N_2} - \frac{T^2}{N} \\ &= \frac{(8)^2}{4} + \frac{(-3)^2}{4} + \frac{(-10)^2}{4} + \frac{(-7)^2}{4} - 9 \\ &= 16 + 2.25 + 25 + 12.25 - 9 \\ SSR &= 46.5\end{aligned}$$

$$\begin{aligned}SST &= \frac{\sum A^2}{N_3} + \frac{\sum B^2}{N_3} + \frac{\sum C^2}{N_3} + \frac{\sum D^2}{N_3} - \frac{T^2}{N} \\ &= \frac{(-1 - 6 + 0 - 5)^2}{4} + \frac{(3 - 2 - 1 + 1)^2}{4} + \frac{(5 + 0 + 4 + 0)^2}{6} \\ &\quad + \frac{(-3 - 7 - 3 + 0)^2}{4} - 9 \\ &= \frac{144}{4} + \frac{1}{4} + \frac{36}{4} + \frac{49}{4} - 9 \\ &= 36 + 0.25 + 9 + 12.25 - 9 \\ SST &= 48.5\end{aligned}$$



# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

AN AUTONOMOUS INSTITUTION



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

$$SSC = 7.5 - 46.5 - 48.5$$

$$= 10.5$$

$$MSC = \frac{SSC}{(M-1)} = \frac{7.5}{3} = 2.5$$

$$MSR = \frac{SSR}{R-1} = \frac{46.5}{3} = 15.5$$

$$MST = \frac{48.5}{R-1} = \frac{48.5}{3} = 16.66$$

$$F_{SS} = \frac{SSB}{(k-1)(N-k)} = \frac{10.5}{6} = 1.75$$

ANOVA Table

Source of variation	Sum of Squares	D.O.F	Mean Sum of Squares	Var. Ratio C.V	Table Value
B/W C	7.5	3	2.5	$\frac{MSC}{MSB} = \frac{2.5}{17.58}$	$F_c(3,6) = 4.76$
B/R	46.5	3	15.5	$\frac{MSR}{MSB} = \frac{15.5}{17.58}$	$F_R(3,6) = 4.76$
B/W T	48.5	3	16.66	$\frac{MST}{MSB} = \frac{16.66}{17.58}$	$F_T(3,6) = 4.76$
Error	10.5	6	1.75	$\frac{MSE}{MSB} = \frac{1.75}{17.58}$	$F_E(3,6) = 4.76$

conclusion  
 $F_c < F_{table}$   
 C.V < T.V  
 $H_0$  is accepted b/w column.