Two-factorial Experiment (2^2)

Srikar

2021-11-10

Introduction:

ANOVA is a statistical test used to determine whether or not there is a significant difference between the means of treatments. The analysis of variance is the systematic algebraic procedure of decomposing (i.e. Partitioning) overall variation. If we find there is significant difference, we conduct a post-hoc test to check where the difference occurs.

Factorial Experiment- Factorial experiments involve simultaneously more than one factor and each factor is at two or more levels. Several factors affect simultaneously the characteristic under study in factorial experiments and
#the experimenter is interested in the main effects and the interaction effects among different factors.

Aim: To find out whether there is significant difference in the 2 factors

Data Description:

The dataset contains the effect of Sulphate and Super Phosphate on the yield of Radish. The combination of two levels of Super Phosphate (S0 and S1) and the two-levels of Sulphate (D0 and D1) are given in the dataset. The design used was Randomized Block Design with 4 repetitions in each block.

```
library(readxl)

data <- read_excel("C:/Users/Srikar/Desktop/SS/R/Sem 5/Design of Exp/Practical 11/dataset.xlsx")

head(data)
```

Dataset

	Fact1	Fact2	Interaction	Yeild
1	P0	D0	P0D0	64
2	P0	D1	P0D1	25
3	P1	D0	P1D0	30
4	P1	D1	P1D1	10
5	P0	D0	P0D0	25
6	P0	D1	P0D1	14

The following dataset contains two factors Phosphate and super sulphate. Phosphat e contains two levels P0 and P1 and similarly Super sulphate consists of S0 and S1. There are totally 16 observations.

Hypothesis Statement

Factor 1:

#H0: There is no significant effect of Factor 1 on crop yield.
#H1: There is a significant effect of Factor 1 on crop yield.

#Factor 2:

#H0: There is no significant effect of Factor 2 on crop yield.
#H1: There is a significant effect of Factor 2 on crop yield.

#Interaction:

#H0: There is no significant effect of interaction of Factor 1 and Factor 2 on crop y ield.
#H1: There is a significant effect of interaction of Factor 1 and Factor 2 on crop yi eld.

Procedure:

1) Constructing the ANOVA model:

```
model=aov(data$Yeild~data$Fact1+data$Fact2+data$Fact1*data$Fact2,data=data)
summary(model)
```

ANOVA Table:

	Df	Sum Sq	Mean Sq	F value	P-Value	
data$Fact1	1	729	729	3.19	0.09934	.
data$Fact2	1	3364	3364	14.722	0.00237	**
data$Fact1:data$Fact2	1	400	400	1.751	0.21047	
Residuals	12	2742	229			

```
## ---

## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

We reject the null hypothesis for () Fact 1 since the p-value is above 0.05 (significa nce level). This means that there is no siginificatn effect on the yield of crop. Simil arly, there is no effect by the interaction of the two factors but we find that there is a significant difference on the effect of Fact 2.

Conclusion:

We observe that Phosphate does not have any significant effect on the yield of crop . There is a significant difference in the effect of super sulphate on the yield of crop s. We also observe that there is no significant effect by interaction of Phosphate an d Sulphate.