Two Way Anova

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Two Way Anova

Definition:

The data shows the Production of Wheat per acre for varieties of seeds and fertilizers. We set up an analysis of variance table for the following two-way results:

```
df <- read.csv(file='Sample.csv')
head(df)
```

```
##   Production Seed Fertilizers
## 1          6    A           W
## 2          7    A           X
## 3          3    A           Y
## 4          8    A           Z
## 5          5    B           W
## 6          5    B           X
```

Shapiro Test

Performing a Shapiro test on the data yields

```
sh <- shapiro.test(df$Production)
sh
```

```
##
##  Shapiro-Wilk normality test
##
## data:  df$Production
## W = 0.91658, p-value = 0.2589
```

As the p-value(0.2588655) is greater than 0.05 we accept the **NULL Hypothesis** and we can say that the data for Production of wheat is normalized.

Bartlett Test

Performing a Bartlett test on the data yields

```
bartlett.test(Production~Seed, data=df)
```

```
##
##  Bartlett test of homogeneity of variances
##
## data:  Production by Seed
## Bartlett's K-squared = 2.16, df = 2, p-value = 0.3396
```

Results shows that p-value is greater than 0.05 so we fail to reject the **null hypothesis** and conclude that the variances are equal across these samples.

```r
bartlett.test(Production~Fertilizers, data=df)
```

```
##
##  Bartlett test of homogeneity of variances
##
## data:  Production by Fertilizers
## Bartlett's K-squared = Inf, df = 3, p-value < 2.2e-16
```

Results of bartlett test shows p-value greater than 0.05 for production vs. seed but for production vs. fertilizers, p-value is less than 0.05.Then also,we can perform the two way Anova Test.

2-Way Annova on the samples

```r
Res.anova <- aov(Production~Seed+Fertilizers , data = df )
Res.anova
```

```
## Call:
##    aov(formula = Production ~ Seed + Fertilizers, data = df)
##
## Terms:
##                     Seed Fertilizers Residuals
## Sum of Squares     8          18         6
## Deg. of Freedom    2           3         6
##
## Residual standard error: 1
## Estimated effects may be unbalanced
```

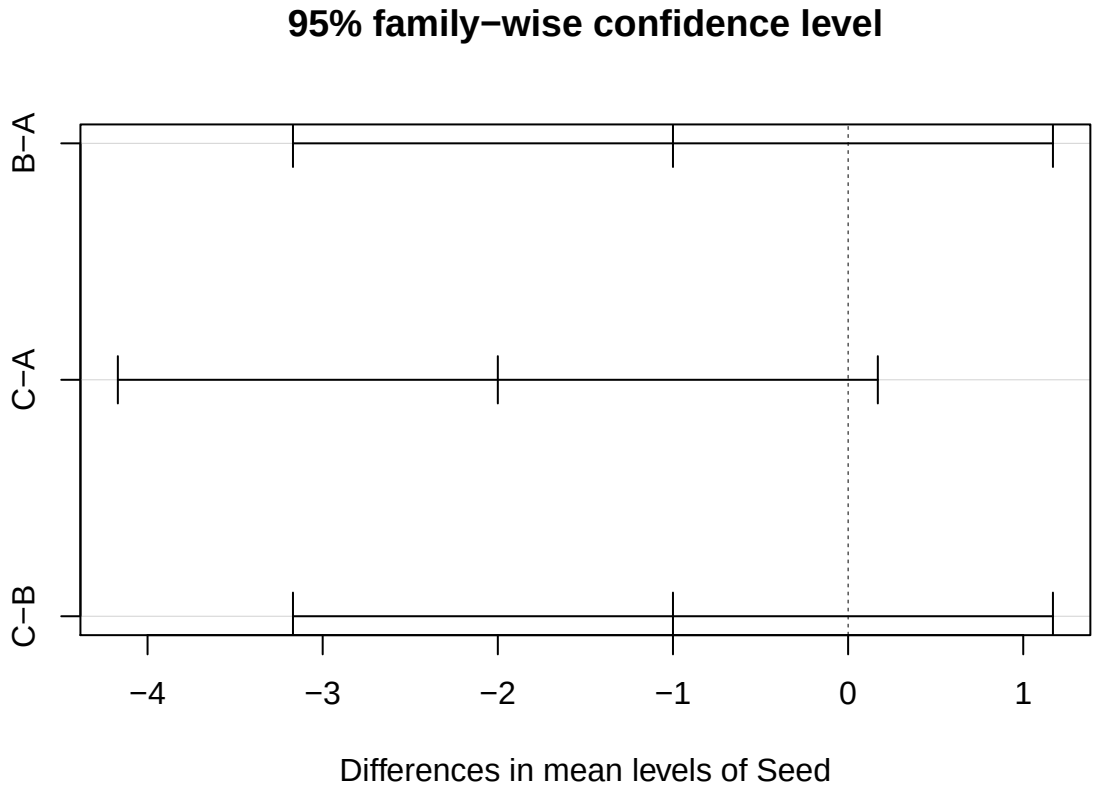
Pair-wise Comparison

```r
TK<- TukeyHSD(Res.anova, "Seed")
TK
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = Production ~ Seed + Fertilizers, data = df)
##
## $Seed
##     diff       lwr       upr     p adj
## B-A   -1 -3.169598 1.1695977 0.3922561
## C-A   -2 -4.169598 0.1695977 0.0673680
## C-B   -1 -3.169598 1.1695977 0.3922561
```

Plot

```r
plot(TK)
```



Conclusion

From the above results, we find that there is no significant difference in Production of wheat in accordance with different seeds and different fertilizers.