**EARLY SEASON TSS**

> Response<-c(9,9.6,8.1,8.3,8.2,9,8.7,9.2,7.3,8.5,9.1,7.6)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1,3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 9.0

2 1 2 9.6

3 1 3 8.1

4 2 1 8.3

5 2 2 8.2

6 2 3 9.0

7 3 1 8.7

8 3 2 9.2

9 3 3 7.3

10 4 1 8.5

11 4 2 9.1

12 4 3 7.6

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 0.510 0.17000 0.4138 0.7494

Sample 2 2.135 1.06750 2.5984 0.1539

Residuals 6 2.465 0.41083

**LATE SEASON TSS**

> Response<-c(7.4,7,6.6,7.6,8,7.6,8.6,8,7.8,8,8.4,7.9)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 7.4

2 1 2 7.0

3 1 3 6.6

4 2 1 7.6

5 2 2 8.0

6 2 3 7.6

7 3 1 8.6

8 3 2 8.0

9 3 3 7.8

10 4 1 8.0

11 4 2 8.4

12 4 3 7.9

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 2.49583 0.83194 10.3633 0.008679 \*\*

Sample 2 0.43167 0.21583 2.6886 0.146674

Residuals 6 0.48167 0.08028

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> LSD.test(rcbd, "Treatment", p.adj = "none",console=TRUE)

Study: rcbd ~ "Treatment"

LSD t Test for Response

Mean Square Error: 0.08027778

Treatment, means and individual ( 95 %) CI

Response std r LCL UCL Min Max

1 7.000000 0.4000000 3 6.599728 7.400272 6.6 7.4

2 7.733333 0.2309401 3 7.333061 8.133605 7.6 8.0

3 8.133333 0.4163332 3 7.733061 8.533605 7.8 8.6

4 8.100000 0.2645751 3 7.699728 8.500272 7.9 8.4

alpha: 0.05 ; Df Error: 6

Critical Value of t: 2.446912

Least Significant Difference 0.5660703

Means with the same letter are not significantly different.

Groups, Treatments and means

a 3 8.133

a 4 8.1

a 2 7.733

b 1 7

**EARLY SEASON VITAMIN C**

> Response<-c(41.65,31.36,35.77,32.34,36.75,31.36,33.81,32.34,32.5,40.18,35.28,41.65)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 41.65

2 1 2 31.36

3 1 3 35.77

4 2 1 32.34

5 2 2 36.75

6 2 3 31.36

7 3 1 33.81

8 3 2 32.34

9 3 3 32.50

10 4 1 40.18

11 4 2 35.28

12 4 3 41.65

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 71.913 23.9712 1.9299 0.226

Sample 2 18.813 9.4065 0.7573 0.509

Residuals 6 4.526 12.4210

**LATE SEASON VITAMIN C**

> Response<-c(29.4,34.3,30.38,29.4,37.24,39.2,42.14,32.34,49.98,46.06,41.8,47.04)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 29.40

2 1 2 34.30

3 1 3 30.38

4 2 1 29.40

5 2 2 37.24

6 2 3 39.20

7 3 1 42.14

8 3 2 32.34

9 3 3 49.98

10 4 1 46.06

11 4 2 41.80

12 4 3 47.04

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 335.64 111.880 3.9407 0.0721 .

Sample 2 68.63 34.315 1.2086 0.3622

Residuals 6 170.35 28.391

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

**Early Season Juice weight**

> Response<-c(662.7,447.6,526.4,635.6,564.6,534.7,581.4,558.2,643.4,642.4,530.8,713.5)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 662.7

2 1 2 447.6

3 1 3 526.4

4 2 1 635.6

5 2 2 564.6

6 2 3 534.7

7 3 1 581.4

8 3 2 558.2

9 3 3 643.4

10 4 1 642.4

11 4 2 530.8

12 4 3 713.5

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 10805 3601.6 0.8353 0.5217

Sample 2 24030 12014.8 2.7865 0.1394

Residuals 6 25871 4311.8

**Late Season Juice weight**

> Response<-c(29.4,34.3,30.38,29.4,37.24,39.2,42.14,32.34,49.98,46.06,41.8,47.04)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 29.40

2 1 2 34.30

3 1 3 30.38

4 2 1 29.40

5 2 2 37.24

6 2 3 39.20

7 3 1 42.14

8 3 2 32.34

9 3 3 49.98

10 4 1 46.06

11 4 2 41.80

12 4 3 47.04

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 335.64 111.880 3.9407 0.0721 .

Sample 2 68.63 34.315 1.2086 0.3622

Residuals 6 170.35 28.391

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

**Early Season Juice Volume**

> Response<-c(162.5,137.5,200,200,150,190,200,151,262.5,180,152,190)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 162.5

2 1 2 137.5

3 1 3 200.0

4 2 1 200.0

5 2 2 150.0

6 2 3 190.0

7 3 1 200.0

8 3 2 151.0

9 3 3 262.5

10 4 1 180.0

11 4 2 152.0

12 4 3 190.0

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 2422.1 807.4 2.0605 0.20701

Sample 2 8050.7 4025.3 10.2731 0.01155 \*

Residuals 6 2351.0 391.8

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> LSD.test(rcbd, "Treatment", p.adj = "none",console=TRUE)

Study: rcbd ~ "Treatment"

LSD t Test for Response

Mean Square Error: 391.8333

Treatment, means and individual ( 95 %) CI

Response std r LCL UCL Min Max

1 166.6667 31.45764 3 138.7021 194.6313 137.5 200.0

2 180.0000 26.45751 3 152.0354 207.9646 150.0 200.0

3 204.5000 55.88604 3 176.5354 232.4646 151.0 262.5

4 174.0000 19.69772 3 146.0354 201.9646 152.0 190.0

alpha: 0.05 ; Df Error: 6

Critical Value of t: 2.446912

Least Significant Difference 39.5479

Means with the same letter are not significantly different.

Groups, Treatments and means

a 3 204.5

a 2 180

a 4 174

a 1 166.7

Treatment Sample

> LSD.test(rcbd, "Sample", p.adj = "none",console=TRUE)

Study: rcbd ~ "Sample"

LSD t Test for Response

Mean Square Error: 391.8333

Sample, means and individual ( 95 %) CI

Response std r LCL UCL Min Max

1 185.625 18.071040 4 161.407 209.843 162.5 200.0

2 147.625 6.799203 4 123.407 171.843 137.5 152.0

3 210.625 34.903140 4 186.407 234.843 190.0 262.5

alpha: 0.05 ; Df Error: 6

Critical Value of t: 2.446912

Least Significant Difference 34.24948

Means with the same letter are not significantly different.

Groups, Treatments and means

a 3 210.6

a 1 185.6

b 2 147.6

**Late Season Juice Volume**

> Response<-c(200.3,245,250,220,255,230,100,270,300,255,170,200)

> Treatment<-c(rep(1,3),rep(2,3),rep(3,3),rep(4,3))

> Sample<-rep(c(1:3),4)

> Frame<-data.frame(Treatment=factor(Treatment),Sample=factor(Sample),Response)

> Frame

Treatment Sample Response

1 1 1 200.3

2 1 2 245.0

3 1 3 250.0

4 2 1 220.0

5 2 2 255.0

6 2 3 230.0

7 3 1 100.0

8 3 2 270.0

9 3 3 300.0

10 4 1 255.0

11 4 2 170.0

12 4 3 200.0

> rcbd<-lm(Response~Treatment+Sample,data=Frame)

> anova(rcbd)

Analysis of Variance Table

Response: Response

Df Sum Sq Mean Sq F value Pr(>F)

Treatment 3 1277.2 425.7 0.1099 0.9512

Sample 2 5885.7 2942.8 0.7596 0.5081

Residuals 6 23245.4 3874.2

**4.2 Data Analysis, Result and Discussion**

**4.2.1 EARLY SEASON Total Soluble Solid (TSS)**

The analysis shows that p=0.7494 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant.

**LATE SEASON Total Soluble Solid (TSS)**

The analysis shows that p=0.008679 for the treatment which is less than p=0.

05, this implies that at 5% level of significance the treatment levels are significant. Further investigation using Least significance difference as to know which of the treatment levels is most significant indicates treatment1 i.e treatment level at 0 tonnes/hectare

**4.2.2 EARLY SEASON VITAMIN C Content**

The analysis shows that p=0.226 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant.

**LATE SEASON VITAMIN C Content**

The analysis shows that p=0.0721 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant.

**4.2.3 Early Season Juice weight**

The analysis shows that p=0.5217 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant.

**Late Season Juice weight**

The analysis shows that p=0.0721 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant.

**4.2.4 Early Season Juice Volume**

The analysis shows that p=0.20701 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant.

**Late Season Juice Volume**

The analysis shows that p=0.9512 for the treatment which is greater than p=0.

05, this implies that at 5% level of significance none of the treatment levels are significant