Multi HW 2nd

2019711351 ChoiTaeYoung

2019 11 29

Contents

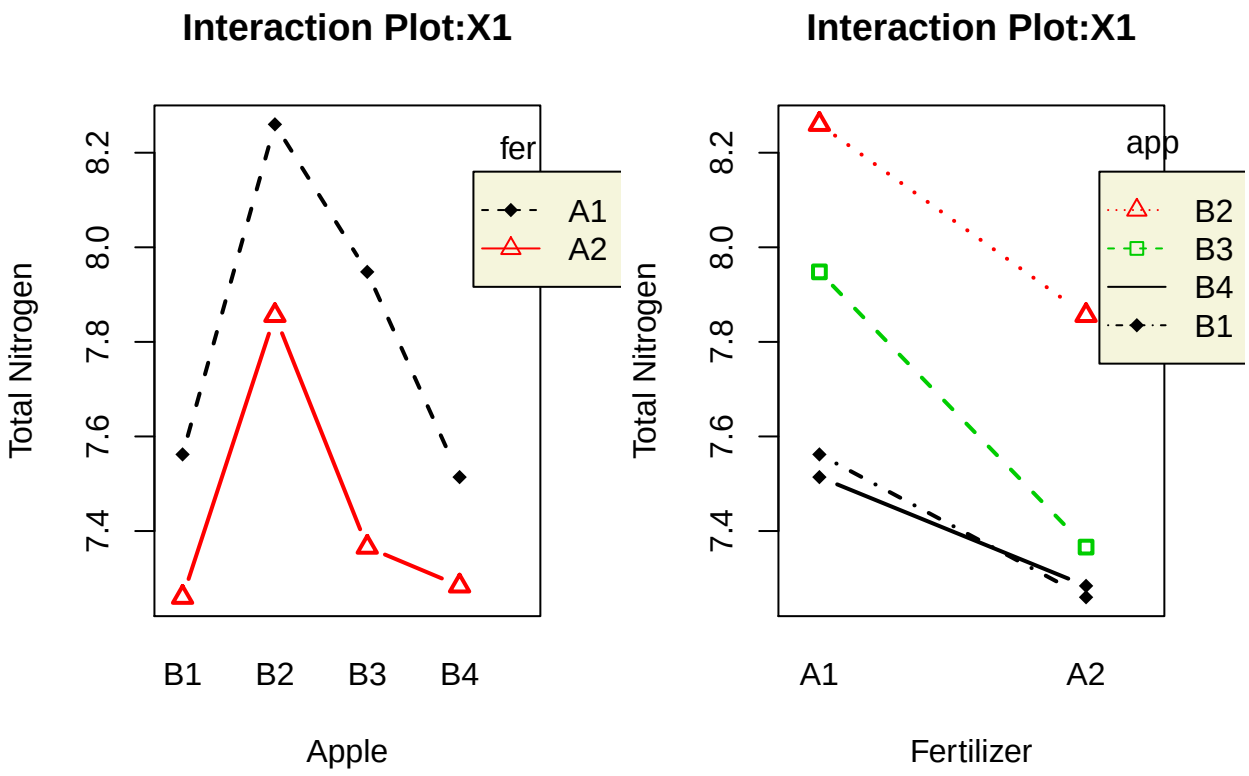
```
#5 MANOVA
hw2=read.csv(file="C:\\Users\\Choi Taeyoung\\OneDrive -    \\1 \\ \\hw2.csv")
attach(hw2)

app=factor(Apple)
fer=factor(Fertilizer)

##two-way ANOVA with interactions for each variable
tx1=aov(X1~app+fer+app:fer)
summary(tx1)
```

```
##             Df Sum Sq Mean Sq F value  Pr(>F)
## app          3  2.852  0.9508   5.865 0.00261 **
## fer          1  1.440  1.4402   8.884 0.00546 **
## app:fer      3  0.175  0.0583   0.360 0.78253
## Residuals   32  5.188  0.1621
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

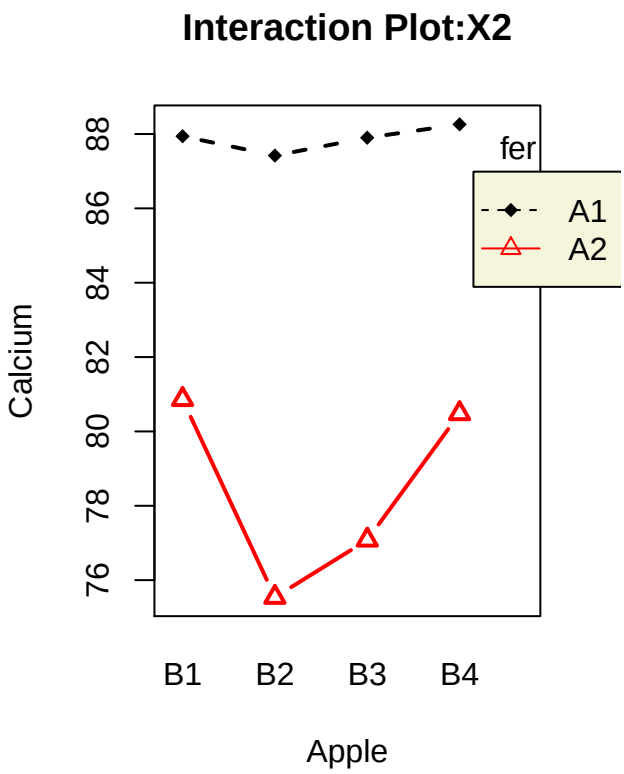
```
tx2=aov(X2~app+fer+app:fer)
summary(tx2)
```

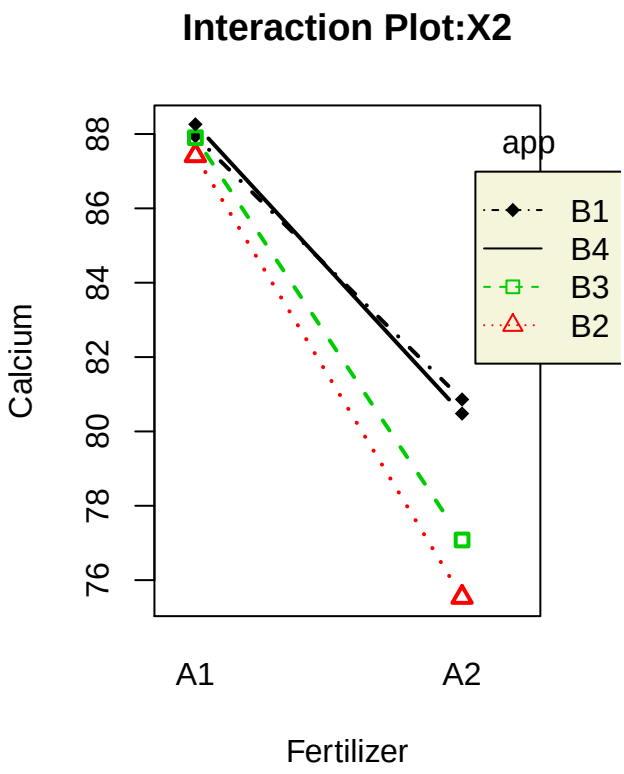
```
##             Df Sum Sq Mean Sq F value   Pr(>F)
## app          3   62.7    20.9   0.741    0.536
## fer          1  881.7   881.7  31.242 3.57e-06 ***
## app:fer      3   40.4    13.5   0.478    0.700
## Residuals   32  903.1    28.2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#two-way interaction plot for Total Nitrogen
par(mfrow=c(1,2))
interaction.plot(app,fer,X1,type="b",col=c(1:3), leg.bty="o",leg.bg="beige",lwd=2,pch=c(18,24,22),xlab=
interaction.plot(fer,app,X1,type="b",col=c(1:3), leg.bty="o",leg.bg="beige",lwd=2,pch=c(18,24,22),xlab=
```




```
#two-way interaction plot for Calcium
par(mfrow=c(1,2))
interaction.plot(app,fer,X2,type="b",col=c(1:3), leg.bty="o",leg.bg="beige",lwd=2,pch=c(18,24,22),xlab=
interaction.plot(fer,app,X2,type="b",col=c(1:3), leg.bty="o",leg.bg="beige",lwd=2,pch=c(18,24,22),xlab=
```






```
##two-way MANOVA
x=cbind(X1,X2) #response vector
fit1=manova(x~fer+app) #manova(x~Apple+Fertilizer)
summary(fit1,test="Wilks")
```

```
##           Df   Wilks approx F num Df den Df    Pr(>F)
## fer        1 0.46460  19.5909      2     34 2.189e-06 ***
## app        3 0.61645   3.1014      6     68   0.00959 **
## Residuals 35
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##two-way MANOVA with interaction
fit2=manova(x~fer+app+fer:app) #manova(x~Apple*Fertilizer)
summary(fit2,test="Wilks")
```

```
##           Df   Wilks approx F num Df den Df    Pr(>F)
## fer        1 0.44926  19.0011      2     31 4.109e-06 ***
## app        3 0.61239   2.8713      6     62   0.01559 *
## fer:app    3 0.92790   0.3939      6     62   0.88020
## Residuals 32
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
detach(hw2)
```