models.R

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```r
library(ggplot2)
library(lme4)
```

```
## Loading required package: Matrix
```

```r
library(nlme)
```

```
##
## Attaching package: 'nlme'

## The following object is masked from 'package:lme4':
##
##     lmList
```

```r
library(lsmeans)
```

```
## Warning: package 'lsmeans' was built under R version 3.2.5

## Loading required package: estimability

## Warning: package 'estimability' was built under R version 3.2.5
```

```r
library(lubridate)
```

```
## Warning: package 'lubridate' was built under R version 3.2.5

##
## Attaching package: 'lubridate'

## The following object is masked from 'package:base':
##
##     date
```

```r
library(multcompView)
```

```
## Warning: package 'multcompView' was built under R version 3.2.5
```

```r
library(car)
```

```
## Warning: package 'car' was built under R version 3.2.5
```

```r
setwd("D:/Iowa State University/Debinski Lab/Nectar data/MAL")

balsvol15 <- read.csv("nectar analysis/Bals 15 vol no outliers/balsvol15sub.csv", header = T)
balsvol16 <- read.csv("nectar analysis/data files/balsvol16.csv", header = T)
balsvolboth <- rbind(balsvol15,balsvol16)

balsvolboth$year <- as.factor(year(balsvolboth$date))

cellN <- with(balsvolboth, table(treatment, year))
cellN
```

```
##          year
## treatment 2015 2016
##         C   30   85
##         H   60   83
```

```r
cellMean <- with(balsvolboth, tapply(volume, list(treatment, year), mean))
cellMean
```

```
##        2015      2016
## C 0.5339394 0.1659893
## H 0.4309091 0.1526835
```

```r
modvol <- lmer(volume ~ treatment * year + (1|plant), data = balsvolboth)

volume.grid <- ref.grid(modvol)
```

```
## Loading required namespace: lmerTest
```

```r
summary(volume.grid)
```

```
##   treatment year prediction        SE    df
## C            2015  0.5439895 0.05067507 77.55
## H            2015  0.4334413 0.03616020 62.38
## C            2016  0.1660275 0.03038201 57.03
## H            2016  0.1529641 0.03049438 68.12
##
## Degrees-of-freedom method: satterthwaite
```

```r
lsmeans(volume.grid, "treatment")
```

```
## NOTE: Results may be misleading due to involvement in interactions
```

```
##   treatment    lsmean         SE    df lower.CL  upper.CL
## C             0.3550085 0.03007777 47.49 0.2945162 0.4155009
## H             0.2932027 0.02465759 29.20 0.2427869 0.3436185
##
## Results are averaged over the levels of: year
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

```r
lsmeans(volume.grid, "year")
```

```
## NOTE: Results may be misleading due to involvement in interactions

##  year    lsmean         SE    df lower.CL  upper.CL
##  2015 0.4887154 0.03112685 71.94 0.4266643 0.5507665
##  2016 0.1594958 0.02152309 62.26 0.1164754 0.2025162
##
## Results are averaged over the levels of: treatment
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

```r
volume.treat <- lsmeans(volume.grid, "treatment")
```

```
## NOTE: Results may be misleading due to involvement in interactions
```

```r
pairs(volume.treat)
```

```
##  contrast   estimate         SE    df t.ratio p.value
##  C - H    0.06180582 0.03889305 38.59   1.589  0.1202
##
## Results are averaged over the levels of: year
```

```r
pairs.treat <- pairs(volume.treat)
test(pairs.treat, joint = T)
```

```
##  df1   df2     F p.value
##    1 38.59 2.525  0.1202
```

```r
volume.year <- lsmeans(volume.grid, "year")
```

```
## NOTE: Results may be misleading due to involvement in interactions
```

```r
pairs(volume.year)
```

```
##  contrast     estimate         SE     df t.ratio p.value
##  2015 - 2016 0.3292196 0.03676383 148.99   8.955  <.0001
##
## Results are averaged over the levels of: treatment
```

```r
pairs.year <- pairs(volume.year)
test(pairs.year, joint = T)
```

```
##  df1    df2      F p.value
##    1 148.99 80.192  <.0001
```

```
int.vol <- pairs(volume.grid, by = "year")
int.vol
```

```
## year = 2015:
##  contrast    estimate         SE     df t.ratio p.value
##  C - H     0.11054820 0.06225370 71.94   1.776  0.0800
##
## year = 2016:
##  contrast    estimate         SE     df t.ratio p.value
##  C - H     0.01306345 0.04304618 62.26   0.303  0.7625
```

```
int.voltable <- update(int.vol, by = NULL)
int.voltable
```

```
##  contrast year    estimate         SE     df t.ratio p.value
##  C - H    2015 0.11054820 0.06225370 71.94   1.776  0.0800
##  C - H    2016 0.01306345 0.04304618 62.26   0.303  0.7625
```

```
test(pairs(int.voltable), joint = T)
```

```
##  df1    df2     F p.value
##    1 148.99 1.758  0.1869
```

```
Anova(modvol, type = 3)
```

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: volume
##                  Chisq Df Pr(>Chisq)
## (Intercept)    115.2371  1  < 2.2e-16 ***
## treatment        3.1534  1    0.07577 .
## year            42.4738  1  7.163e-11 ***
## treatment:year   1.7578  1    0.18490
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```