ModBalsMassBoth.R

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

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

```
library(nlme)
```

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

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

```
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
```

```
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
```

```
library(multcompView)
```

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

```
library(car)
```

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

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

balssug15 <- read.csv("nectar analysis/data files/balssugar15.csv", header = T)
balssug16 <- read.csv("nectar analysis/data files/balssugar16.csv", header = T)
balssugboth <- rbind(balssug15,balssug16)

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

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

```
##          year
## treatment 2015 2016
##         C   30   80
##         H   56   71
```

```r
cellMean <- with(balssugboth, tapply(mass, list(treatment, year), mean))
cellMean
```

```
##         2015       2016
## C 0.09528345 0.04865045
## H 0.10940649 0.05275608
```

```r
modmass <- lmer(mass ~ treatment * year + (1|plant), data = balssugboth)

mass.grid <- ref.grid(modmass)
```

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

```r
summary(mass.grid)
```

```
##  treatment year prediction          SE    df
##  C         2015 0.10032490 0.012827074 86.14
##  H         2015 0.11236476 0.009467422 69.04
##  C         2016 0.04743873 0.008056081 52.34
##  H         2016 0.05297754 0.008244831 71.10
##
## Degrees-of-freedom method: satterthwaite
```

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

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

```
##  treatment     lsmean          SE    df   lower.CL   upper.CL
##  C         0.07388182 0.007896988 48.70 0.05800973 0.08975390
##  H         0.08267115 0.006848899 33.87 0.06875053 0.09659177
##
## Results are averaged over the levels of: year
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

```
lsmeans(mass.grid, "year")
```

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

```
##  year     lsmean          SE    df   lower.CL   upper.CL
##  2015 0.10634483 0.007971291 79.56 0.09048012 0.12220954
##  2016 0.05020813 0.005763629 60.99 0.03868300 0.06173327
##
## Results are averaged over the levels of: treatment
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

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

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

```
pairs(mass.treat)
```

```
##  contrast     estimate         SE   df t.ratio p.value
##  C - H    -0.008789331 0.01045322 41.4  -0.841  0.4053
##
## Results are averaged over the levels of: year
```

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

```
##  df1  df2     F p.value
##    1 41.4 0.707  0.4053
```

```
mass.year <- lsmeans(mass.grid, "year")
```

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

```
pairs(mass.year)
```

```
##  contrast     estimate          SE     df t.ratio p.value
##  2015 - 2016 0.0561367 0.009178886 166.94   6.116  <.0001
##
## Results are averaged over the levels of: treatment
```

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

```
##  df1    df2      F p.value
##    1 166.94 37.404  <.0001
```

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

```
## year = 2015:
##  contrast     estimate         SE    df t.ratio p.value
##  C - H    -0.012039857 0.01594258 79.56  -0.755  0.4524
##
## year = 2016:
##  contrast     estimate         SE    df t.ratio p.value
##  C - H    -0.005538805 0.01152726 60.99  -0.480  0.6326
```

```
int.masstable <- update(int.mass, by = NULL)
int.masstable
```

```
##  contrast year     estimate         SE    df t.ratio p.value
##  C - H    2015 -0.012039857 0.01594258 79.56  -0.755  0.4524
##  C - H    2016 -0.005538805 0.01152726 60.99  -0.480  0.6326
```

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

```
##  df1    df2     F p.value
##    1 166.94 0.125  0.7237
```

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

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: mass
##                  Chisq Df Pr(>Chisq)
## (Intercept)    61.1734  1  5.226e-15 ***
## treatment       0.5703  1  0.4501283
## year           13.3558  1  0.0002576 ***
## treatment:year  0.1254  1  0.7232409
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```