ModBuckMassBoth.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")

bucksug15 <- read.csv("nectar analysis/data files/bucksugar15.csv", header = T)
bucksug16 <- read.csv("nectar analysis/data files/bucksugar16.csv", header = T)
bucksugboth <- rbind(bucksug15,bucksug16)

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

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

```
##          year
## treatment 2015 2016
##         C  204  142
##         H  207  154
```

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

```
##        2015       2016
## C 0.2540452 0.06895813
## H 0.2286501 0.06313010
```

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

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

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

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

```
##  treatment year prediction          SE    df
##  C         2015 0.25269065 0.009493994 15.14
##  H         2015 0.22982077 0.009512845 14.94
##  C         2016 0.06703103 0.010636234 22.47
##  H         2016 0.06278206 0.010272811 20.39
##
## 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         0.1598608 0.008591701 10.02 0.1407218 0.1789999
##  H         0.1463014 0.008493586  9.57 0.1272613 0.1653415
##
## 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 0.24125571 0.006719936 15.04 0.22693557 0.25557585
##  2016 0.06490654 0.007393581 21.43 0.04954946 0.08026362
##
## 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    0.01355943 0.01208132 9.79   1.122  0.2885
##
## Results are averaged over the levels of: year
```

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

```
##  df1  df2    F p.value
##    1 9.79 1.26  0.2885
```

```
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 0.1763492 0.007327128 702.94  24.068  <.0001
##
## Results are averaged over the levels of: treatment
```

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

```
##  df1    df2       F p.value
##    1 702.94 579.268  <.0001
```

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

```
## year = 2015:
##  contrast    estimate         SE    df t.ratio p.value
##  C - H    0.022869885 0.01343987 15.04   1.702  0.1094
##
## year = 2016:
##  contrast    estimate         SE    df t.ratio p.value
##  C - H    0.004248971 0.01478716 21.43   0.287  0.7766
```

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

```
##  contrast year    estimate         SE    df t.ratio p.value
##  C - H    2015 0.022869885 0.01343987 15.04   1.702  0.1094
##  C - H    2016 0.004248971 0.01478716 21.43   0.287  0.7766
```

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

```
##  df1    df2     F p.value
##    1 702.94 1.615  0.2043
```

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

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: mass
##                   Chisq Df Pr(>Chisq)
## (Intercept)    708.4031  1    < 2e-16 ***
## treatment        2.8956  1    0.08882 .
## year           309.8061  1    < 2e-16 ***
## treatment:year   1.6146  1    0.20384
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```