ModBalsBRIXBoth.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   28   80
##         H   54   71
```

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

```
##       2015     2016
## C 17.32143 25.41250
## H 24.40741 28.08451
```

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

BRIX.grid <- ref.grid(modBRIX)
```

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

```r
summary(BRIX.grid)
```

```
##  treatment year prediction       SE     df
##  C         2015   17.46449 2.067689 106.62
##  H         2015   24.17512 1.530013  77.46
##  C         2016   25.08299 1.288564  56.82
##  H         2016   28.29541 1.310458  74.26
##
## Degrees-of-freedom method: satterthwaite
```

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

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

```
##  treatment   lsmean       SE    df lower.CL upper.CL
##  C         21.27374 1.281357 58.26 18.70907 23.83842
##  H         26.23526 1.114538 38.94 23.98079 28.48974
##
## Results are averaged over the levels of: year
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

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

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

```
##  year   lsmean        SE    df lower.CL upper.CL
##  2015 20.81981 1.2861064 95.04 18.26658 23.37304
##  2016 26.68920 0.9189256 64.93 24.85394 28.52446
##
## Results are averaged over the levels of: treatment
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

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

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

```r
pairs(BRIX.treat)
```

```
##  contrast  estimate       SE    df t.ratio p.value
##  C - H    -4.961521 1.698255 48.62  -2.922  0.0053
##
## Results are averaged over the levels of: year
```

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

```
##  df1   df2     F p.value
##    1 48.62 8.535  0.0053
```

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

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

```r
pairs(BRIX.year)
```

```
##  contrast     estimate       SE     df t.ratio p.value
##  2015 - 2016 -5.869395 1.453588 183.17  -4.038  0.0001
##
## Results are averaged over the levels of: treatment
```

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

```
##  df1    df2      F p.value
##    1 183.17 16.304  0.0001
```

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

```
## year = 2015:
##  contrast  estimate       SE    df t.ratio p.value
##  C - H    -6.710625 2.572213 95.04  -2.609  0.0106
##
## year = 2016:
##  contrast  estimate       SE    df t.ratio p.value
##  C - H    -3.212417 1.837851 64.93  -1.748  0.0852
```

```r
int.BRIXtable <- update(int.BRIX, by = NULL)
int.BRIXtable
```

```
##  contrast year  estimate       SE    df t.ratio p.value
##  C - H    2015 -6.710625 2.572213 95.04  -2.609  0.0106
##  C - H    2016 -3.212417 1.837851 64.93  -1.748  0.0852
```

```r
test(pairs(int.BRIXtable), joint = T)
```

```
##  df1    df2     F p.value
##    1 183.17 1.448  0.2304
```

```r
Anova(modBRIX, type = 3)
```

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: BRIX
##                  Chisq Df Pr(>Chisq)
## (Intercept)    71.3414  1  < 2.2e-16 ***
## treatment       6.8063  1  0.0090836 **
## year           10.9430  1  0.0009396 ***
## treatment:year  1.4479  1  0.2288600
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```