ModBuckBRIXBoth.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(BRIX, list(treatment, year), mean))
cellMean
```

```
##       2015     2016
## C 46.47549 56.78169
## H 55.34300 57.53896
```

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

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

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

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

```
##  treatment year prediction       SE    df
##  C         2015   46.26270 1.651525 11.71
##  H         2015   55.49963 1.655251 11.77
##  C         2016   55.39160 1.751386 14.67
##  H         2016   57.98460 1.717061 13.65
##
## 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         50.82715 1.581987 9.84 47.29455 54.35975
##  H         56.74212 1.574651 9.65 53.21651 60.26773
##
## 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 50.88117 1.169122 11.74 48.32762 53.43471
##  2016 56.68810 1.226341 14.15 54.06055 59.31565
##
## 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    -5.914966 2.232086 9.75   -2.65  0.0248
##
## 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 9.75 7.022  0.0248
```

```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 -5.806933 0.8713861 699.05  -6.664  <.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
##    1 699.05 44.409  <.0001
```

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

```
## year = 2015:
##  contrast  estimate       SE    df t.ratio p.value
##  C - H    -9.236928 2.338245 11.74  -3.950  0.0020
##
## year = 2016:
##  contrast  estimate       SE    df t.ratio p.value
##  C - H    -2.593004 2.452683 14.15  -1.057  0.3081
```

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

```
##  contrast year  estimate       SE    df t.ratio p.value
##  C - H    2015 -9.236928 2.338245 11.74  -3.950  0.0020
##  C - H    2016 -2.593004 2.452683 14.15  -1.057  0.3081
```

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

```
##  df1    df2      F p.value
##    1 699.05 14.533  0.0001
```

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

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: BRIX
##                  Chisq Df Pr(>Chisq)
## (Intercept)    784.679  1  < 2.2e-16 ***
## treatment       15.605  1  7.803e-05 ***
## year            52.777  1  3.737e-13 ***
## treatment:year  14.533  1  0.0001377 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```