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
```

```
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)
rm(bucksug15)
rm(bucksug16)

bucksugboth$lnmass <- log(bucksugboth$mass)
bucksugboth$year <- as.factor(year(bucksugboth$date))

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

```
##          year
## treatment 2015 2016
##         C  208  142
##         H  208  154
```

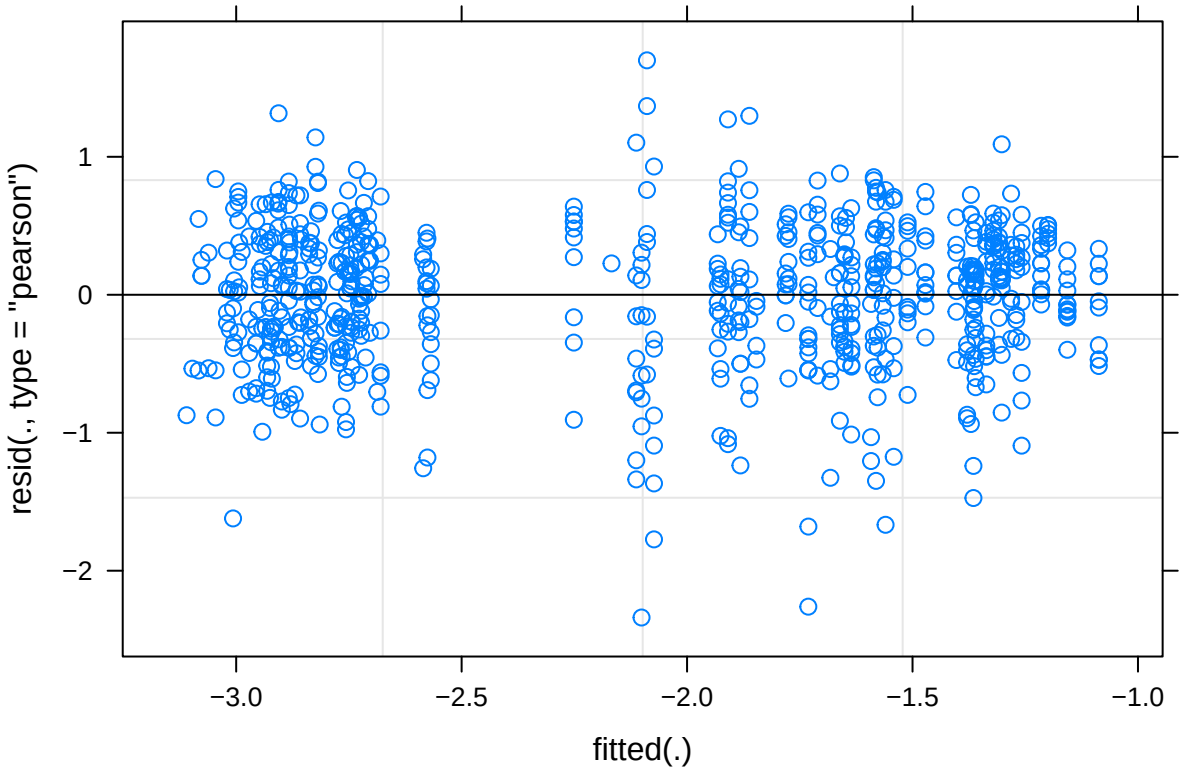
```
cellMean <- with(bucksugboth, tapply(mass, list(treatment, year), mean))
cellMean
```

```
##        2015       2016
## C 0.2549647 0.06895813
## H 0.2302839 0.06313010
```

```
modlnmass <- lmer(lnmass ~ treatment * year + (1|plot) + (1|year:date), data = bucksugboth)
summary(modlnmass)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: lnmass ~ treatment * year + (1 | plot) + (1 | year:date)
##    Data: bucksugboth
##
## REML criterion at convergence: 1140.9
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.5429 -0.6146  0.1116  0.7043  3.2995
##
## Random effects:
##  Groups    Name        Variance Std.Dev.
##  year:date (Intercept) 0.070749 0.26599
##  plot      (Intercept) 0.008609 0.09278
##  Residual              0.265160 0.51494
## Number of obs: 712, groups:  year:date, 20; plot, 12
##
## Fixed effects:
##                     Estimate Std. Error t value
## (Intercept)         -1.57940    0.09066 -17.422
## treatmentH          -0.09462    0.07426  -1.274
## year2016            -1.25697    0.13797  -9.111
## treatmentH:year2016  0.02511    0.07958   0.316
##
## Correlation of Fixed Effects:
##             (Intr) trtmnH yr2016
## treatmentH  -0.408
## year2016    -0.541  0.125
## trtmnH:2016  0.180 -0.438 -0.298
```

```
plot(modlnmass)
```




```
#inflmass <- influence(modlnmass, obs = T)
#plot(inflmass, which = "cook", main = "Buckwheat mass")

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

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

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

```
##  treatment year prediction         SE    df
##  C         2015  -1.579401 0.09065566 24.95
##  H         2015  -1.674023 0.09076395 24.99
##  C         2016  -2.836376 0.11718199 23.57
##  H         2016  -2.905890 0.11625336 22.88
##
## Degrees-of-freedom method: satterthwaite
```

```
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    0.08206807 0.06713034 9.15   1.223  0.2521
##
## Results are averaged over the levels of: year
```

```
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 1.244421 0.1317097 17.37   9.448  <.0001
##
## Results are averaged over the levels of: treatment
```

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

```
##  contrast year   estimate         SE    df t.ratio p.value
##  C - H    2015 0.09462173 0.07425815 13.76   1.274  0.2237
##  C - H    2016 0.06951441 0.08163976 19.46   0.851  0.4049
```

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

```
##  df1    df2   F p.value
##    1 691.26 0.1  0.7525
```

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

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: lnmass
##                   Chisq Df Pr(>Chisq)
## (Intercept)    303.5255  1     <2e-16 ***
## treatment        1.6237  1     0.2026
## year            83.0070  1     <2e-16 ***
## treatment:year   0.0995  1     0.7524
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```