ModBalsVolBoth.R

Audrey McCombs

Sun Nov 27 19:31:46 2016

```
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")

balsvol15 <- read.csv("nectar analysis/data files/balsvol15.csv", header = T)
balsvol16 <- read.csv("nectar analysis/data files/balsvol16.csv", header = T)
balsvolboth <- rbind(balsvol15,balsvol16)

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

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

```
##           year
## treatment 2015 2016
##         C   31   85
##         H   61   83
```

```r
cellMean <- with(balsvolboth, tapply(volume, list(treatment, year), mean))
cellMean
```

```
##        2015      2016
## C 0.6404692 0.1659893
## H 0.4891207 0.1526835
```

```r
modvol <- lm(volume ~ treatment + year + treatment:year, data = balsvolboth)

volume.grid <- ref.grid(modvol)
summary(volume.grid)
```

```
##  treatment year prediction         SE  df
##  C         2015  0.6404692 0.07132079 256
##  H         2015  0.4891207 0.05084311 256
##  C         2016  0.1659893 0.04307126 256
##  H         2016  0.1526835 0.04358710 256
```

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

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

```
##  treatment    lsmean         SE  df  lower.CL  upper.CL
##  C         0.4032293 0.04165870 256 0.3211919 0.4852666
##  H         0.3209021 0.03348454 256 0.2549619 0.3868423
##
## Results are averaged over the levels of: year
## Confidence level used: 0.95
```

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

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

```
##  year    lsmean         SE  df  lower.CL  upper.CL
##  2015 0.5647950 0.04379406 256 0.4785525 0.6510375
##  2016 0.1593364 0.03063890 256 0.0990000 0.2196728
##
## Results are averaged over the levels of: treatment
## Confidence level used: 0.95
```

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

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

```
pairs(volume.treat)
```

```
##  contrast   estimate         SE  df t.ratio p.value
##  C - H    0.08232717 0.05344774 256    1.54  0.1247
##
## Results are averaged over the levels of: year
```

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

```
##  df1 df2     F p.value
##    1 256 2.373  0.1247
```

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

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

```
pairs(volume.year)
```

```
##  contrast     estimate         SE  df t.ratio p.value
##  2015 - 2016 0.4054586 0.05344774 256   7.586  <.0001
##
## Results are averaged over the levels of: treatment
```

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

```
##  df1 df2      F p.value
##    1 256 57.549  <.0001
```

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

```
## year = 2015:
##  contrast   estimate         SE  df t.ratio p.value
##  C - H    0.15134849 0.08758811 256   1.728  0.0852
##
## year = 2016:
##  contrast   estimate         SE  df t.ratio p.value
##  C - H    0.01330584 0.06127780 256   0.217  0.8283
```

```
int.voltable <- update(int.vol, by = NULL)
int.voltable
```

```
##  contrast year   estimate         SE  df t.ratio p.value
##  C - H    2015 0.15134849 0.08758811 256   1.728  0.0852
##  C - H    2016 0.01330584 0.06127780 256   0.217  0.8283
```

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

```
##  df1 df2     F p.value
##    1 256 1.668  0.1977
```

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

```
## Anova Table (Type III tests)
##
## Response: volume
##                Sum Sq  Df F value    Pr(>F)
## (Intercept)    12.716   1 80.6425 < 2.2e-16 ***
## treatment       0.471   1  2.9858    0.0852 .
## year            5.114   1 32.4313 3.379e-08 ***
## treatment:year  0.263   1  1.6677    0.1977
## Residuals      40.368 256
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
############################################################

modvol <- lmer(volume ~ treatment * year + (1|plant), data = balsvolboth)

volume.grid <- ref.grid(modvol)
```

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

```
summary(volume.grid)
```

```
##  treatment year prediction         SE    df
##  C         2015  0.6400782 0.07158869 57.54
##  H         2015  0.4894903 0.05103742 55.90
##  C         2016  0.1661325 0.04322628 60.97
##  H         2016  0.1527803 0.04372426 74.23
##
## Degrees-of-freedom method: satterthwaite
```

```
lsmeans(volume.grid, "treatment")
```

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

```
##  treatment    lsmean        SE    df  lower.CL  upper.CL
##  C         0.4031053 0.0418523 40.67 0.3185621 0.4876485
##  H         0.3211353 0.0336804 27.29 0.2520631 0.3902076
##
## Results are averaged over the levels of: year
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

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

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

```
##  year    lsmean         SE    df   lower.CL  upper.CL
##  2015 0.5647842 0.04395952 56.98 0.47675614 0.6528123
##  2016 0.1594564 0.03074216 67.24 0.09809892 0.2208139
##
## Results are averaged over the levels of: treatment
## Degrees-of-freedom method: satterthwaite
## Confidence level used: 0.95
```

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

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

```
pairs(volume.treat)
```

```
##  contrast   estimate         SE    df t.ratio p.value
##  C - H    0.08196999 0.05372136 34.49   1.526  0.1362
##
## Results are averaged over the levels of: year
```

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

```
##  df1   df2     F p.value
##    1 34.49 2.328  0.1362
```

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

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

```
pairs(volume.year)
```

```
##  contrast     estimate         SE     df t.ratio p.value
##  2015 - 2016 0.4053278 0.05356357 119.12   7.567  <.0001
##
## Results are averaged over the levels of: treatment
```

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

```
##  df1    df2      F p.value
##    1 119.12 57.263  <.0001
```

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

```
## year = 2015:
##  contrast   estimate         SE    df t.ratio p.value
##  C - H    0.15058784 0.08791905 56.98   1.713  0.0922
##
## year = 2016:
##  contrast   estimate         SE    df t.ratio p.value
##  C - H    0.01335215 0.06148432 67.24   0.217  0.8287
```

```
int.voltable <- update(int.vol, by = NULL)
int.voltable
```

```
##  contrast year   estimate         SE    df t.ratio p.value
##  C - H    2015 0.15058784 0.08791905 56.98   1.713  0.0922
##  C - H    2016 0.01335215 0.06148432 67.24   0.217  0.8287
```

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

```
##  df1    df2     F p.value
##    1 119.12 1.641  0.2027
```

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

```
## Analysis of Deviance Table (Type III Wald chisquare tests)
##
## Response: volume
##                  Chisq Df Pr(>Chisq)
## (Intercept)    79.9424  1  < 2.2e-16 ***
## treatment       2.9337  1    0.08675 .
## year           32.1791  1  1.406e-08 ***
## treatment:year  1.6411  1    0.20017
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```