# BuckSugarExplr.R

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```
library(ggplot2)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
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)

#Data summaries

summary(bucksug15)
```

```
##          date          plot     treatment      quad          BRIX
##  2015-06-23: 45   WSR10  : 45   C:204     WSR10NE: 13   Min.   : 2.00
##  2015-06-22: 42   WH12   : 44   H:207     WH12NW : 12   1st Qu.:46.00
##  2015-06-24: 38   EH4    : 42             WHSR9SW: 12   Median :54.00
##  2015-06-21: 37   CH5    : 39             EC3NE  : 11   Mean   :50.94
##  2015-06-30: 33   WHSR9  : 39             EC3SW  : 11   3rd Qu.:60.00
##  2015-06-25: 31   EC3    : 38             EH4NE  : 11   Max.   :76.00
##  (Other)   :185   (Other):164             (Other):341
##       mass
##  Min.   :0.01179
##  1st Qu.:0.14325
##  Median :0.23234
##  Mean   :0.24125
##  3rd Qu.:0.32087
##  Max.   :0.80931
##
```

```
summary(bucksug16)
```

```
##          date         plot     treatment      quad          BRIX
```

```
##  2016-06-23:49   WSR10  : 43   C:142     EHSR1SW: 14   Min.   :36.00
##  2016-06-24:58   WHSR9  : 40   H:154     WSR10NE: 13   1st Qu.:51.00
##  2016-06-25:42   CC6    : 37             WSR10NW: 12   Median :58.00
##  2016-06-26:42   WH12   : 34             CC6NW  : 11   Mean   :57.18
##  2016-06-27:48   CH5    : 21             ESR2NE : 11   3rd Qu.:64.00
##  2016-06-29:44   CHSR8  : 21             WHSR9NE: 11   Max.   :72.00
##  2016-06-30:13   (Other):100             (Other):224
##       mass
##  Min.   :0.009774
##  1st Qu.:0.042091
##  Median :0.060977
##  Mean   :0.065926
##  3rd Qu.:0.084478
##  Max.   :0.203829
##
```

```
summary(bucksugboth)
```

```
##          date          plot     treatment      quad          BRIX
##  2016-06-24: 58   WSR10  : 88   C:346     WSR10NE: 26   Min.   : 2.00
##  2016-06-23: 49   WHSR9  : 79   H:361     EHSR1SW: 22   1st Qu.:48.00
##  2016-06-27: 48   WH12   : 78             WH12NW : 22   Median :55.00
##  2015-06-23: 45   CC6    : 71             WSR10NW: 22   Mean   :53.55
##  2016-06-29: 44   EH4    : 63             EH4NE  : 21   3rd Qu.:62.00
##  2015-06-22: 42   CH5    : 60             WHSR9SW: 21   Max.   :76.00
##  (Other)   :421   (Other):268             (Other):573
##       mass
##  Min.   :0.009774
##  1st Qu.:0.063530
##  Median :0.117900
##  Mean   :0.167850
##  3rd Qu.:0.259158
##  Max.   :0.809307
##
```

```
summarize(group_by(bucksug15, treatment), meanBRIX = mean(BRIX), sdBRIX = sd(BRIX))
```

```
## Source: local data frame [2 x 3]
##
##   treatment meanBRIX   sdBRIX
##      (fctr)    (dbl)    (dbl)
## 1         C 46.47549 15.18148
## 2         H 55.34300 12.21026
```

```
summarize(group_by(bucksug16, treatment), meanBRIX = mean(BRIX), sdBRIX = sd(BRIX))
```

```
## Source: local data frame [2 x 3]
##
##   treatment meanBRIX   sdBRIX
##      (fctr)    (dbl)    (dbl)
## 1         C 56.78169 8.291768
## 2         H 57.53896 7.460688
```

```
summarize(group_by(bucksugboth, treatment), meanBRIX = mean(BRIX), sdBRIX = sd(BRIX))
```

```
## Source: local data frame [2 x 3]
##
##   treatment meanBRIX   sdBRIX
##      (fctr)    (dbl)    (dbl)
## 1         C 50.70520 13.76552
## 2         H 56.27978 10.49534
```

```
summarize(group_by(bucksug15, treatment), meanmass = mean(mass), sdmass = sd(mass))
```

```
## Source: local data frame [2 x 3]
##
##   treatment  meanmass    sdmass
##      (fctr)     (dbl)     (dbl)
## 1         C 0.2540452 0.1243885
## 2         H 0.2286501 0.1222978
```

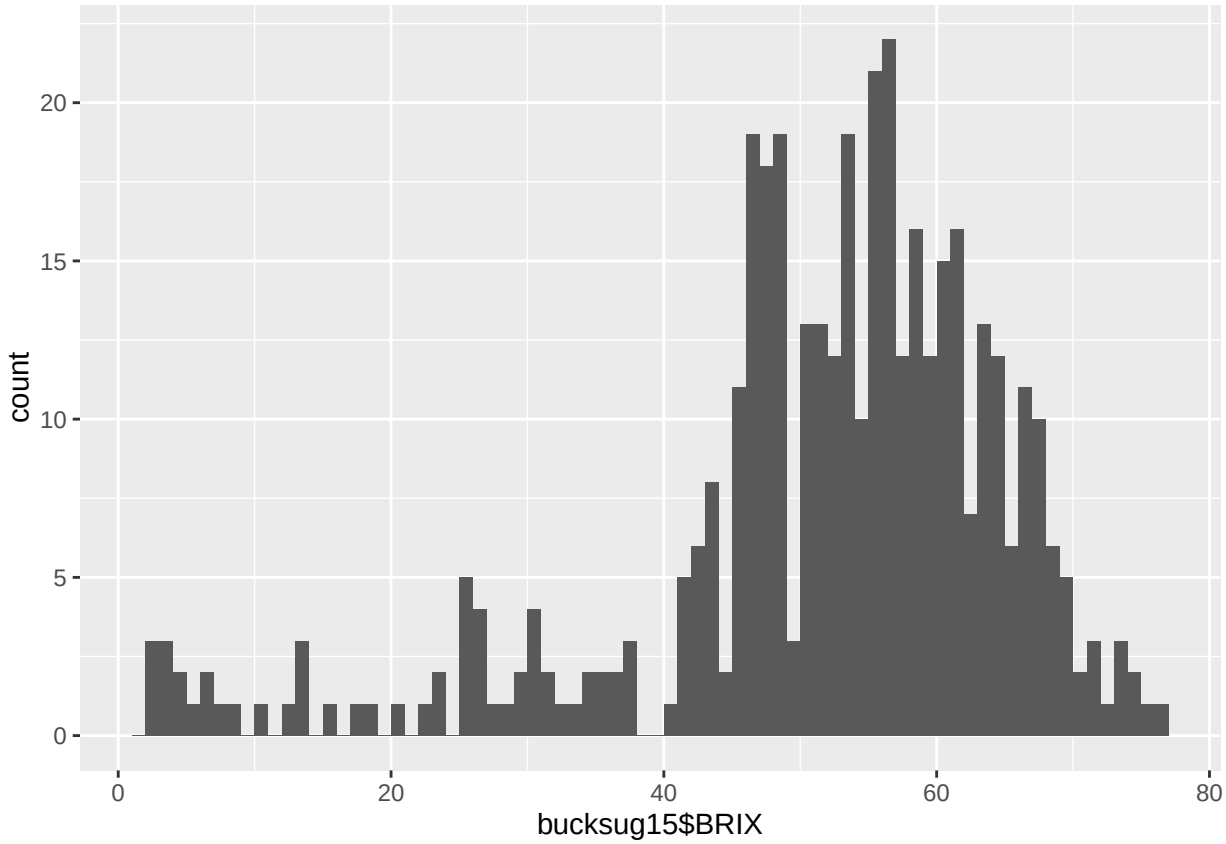
```
summarize(group_by(bucksug16, treatment), meanmass = mean(mass), sdmass = sd(mass))
```

```
## Source: local data frame [2 x 3]
##
##   treatment   meanmass     sdmass
##      (fctr)      (dbl)      (dbl)
## 1         C 0.06895813 0.03252060
## 2         H 0.06313010 0.02899796
```

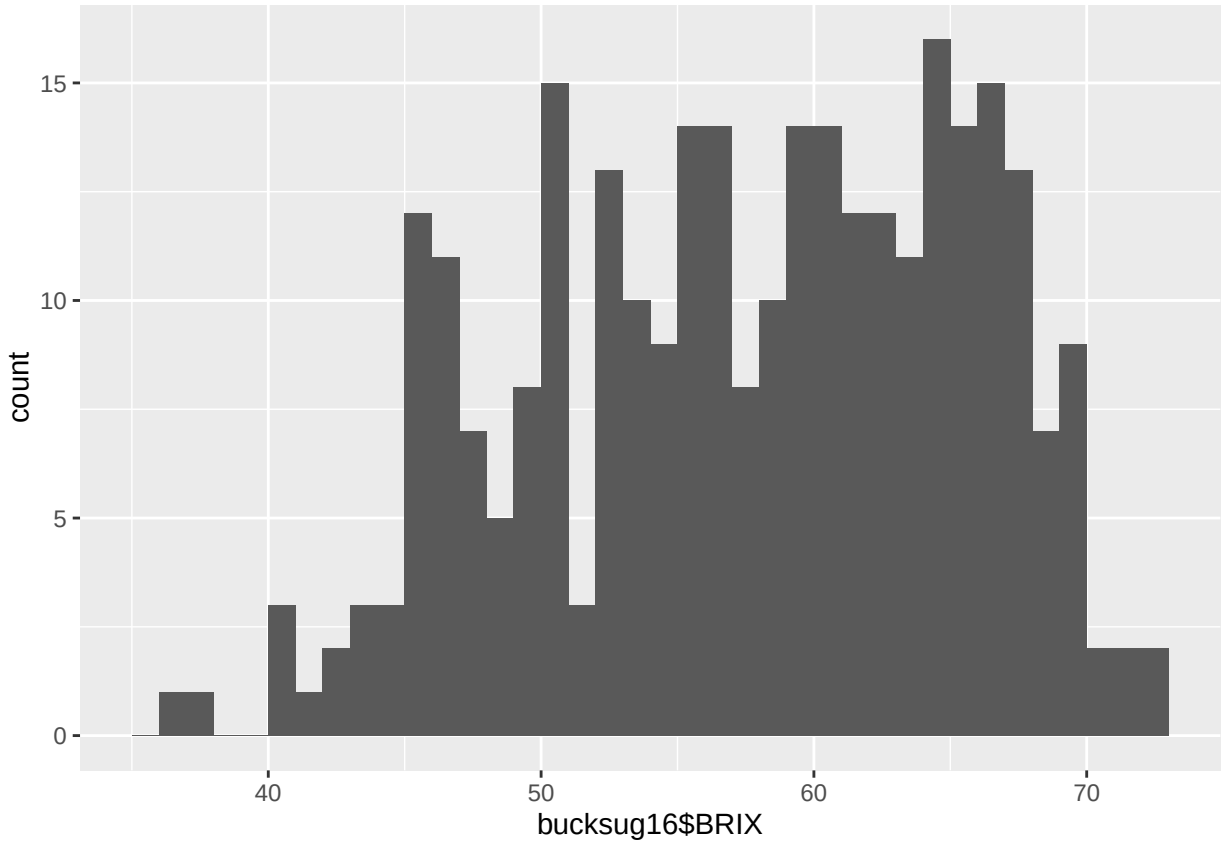
```
summarize(group_by(bucksugboth, treatment), meanmass = mean(mass), sdmass = sd(mass))
```

```
## Source: local data frame [2 x 3]
##
##   treatment  meanmass    sdmass
##      (fctr)     (dbl)     (dbl)
## 1         C 0.1780846 0.1336027
## 2         H 0.1580405 0.1250446
```

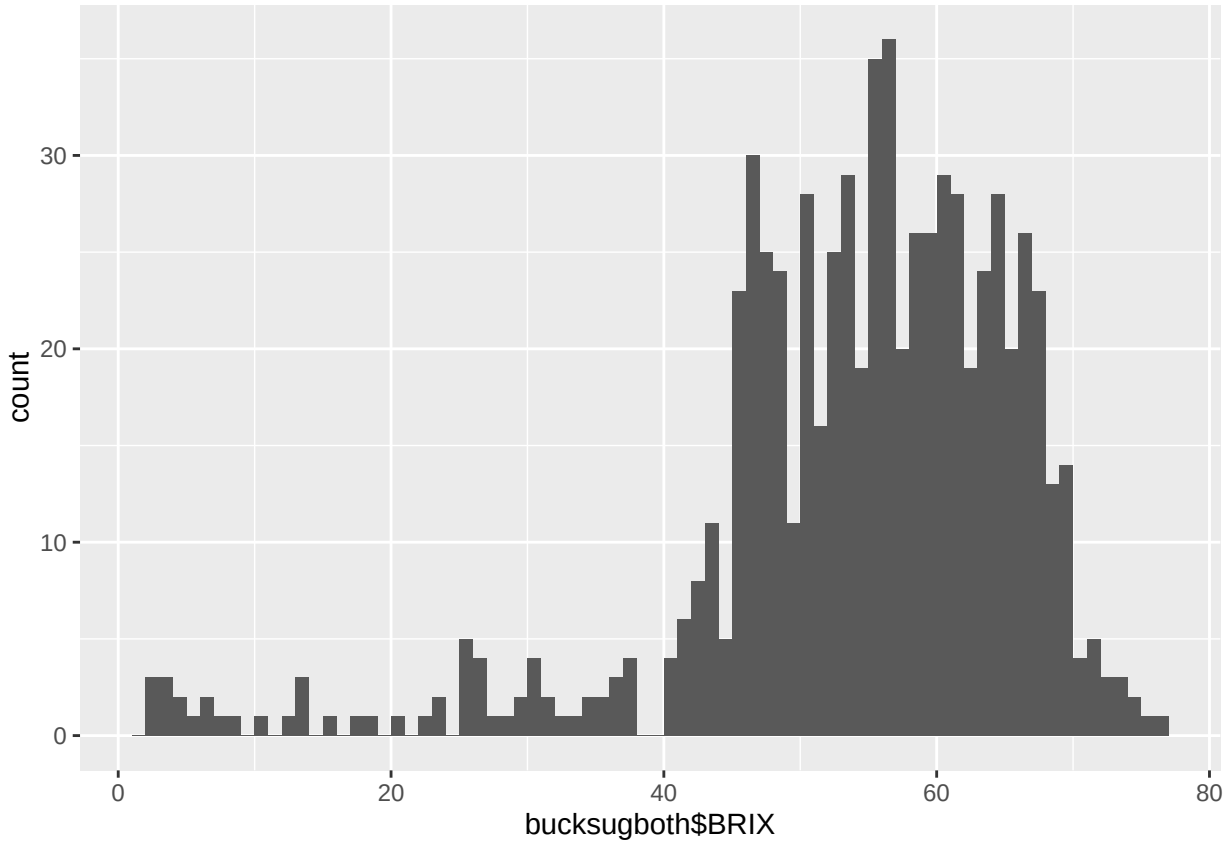
```
qplot(bucksug15$BRIX, binwidth = 1)
```



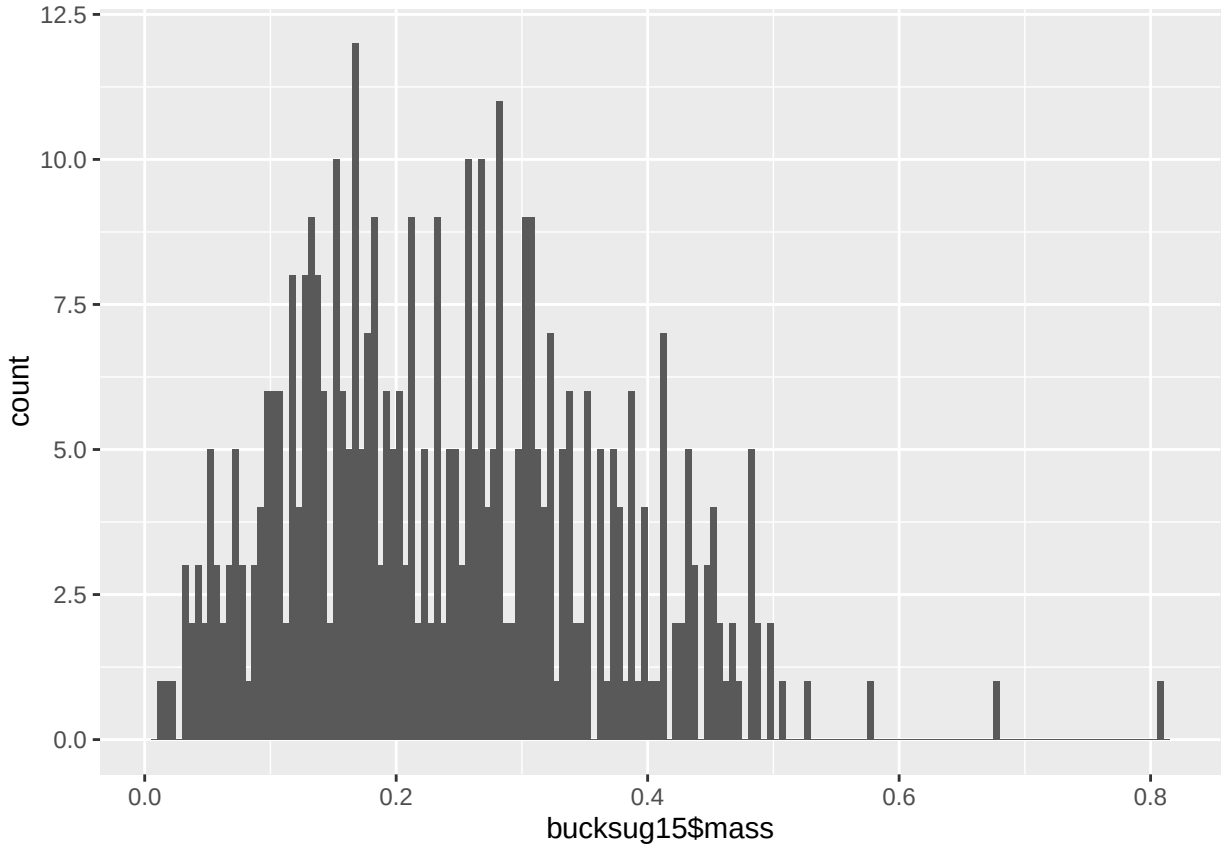

```
qplot(bucksug16$BRIX, binwidth = 1)
```



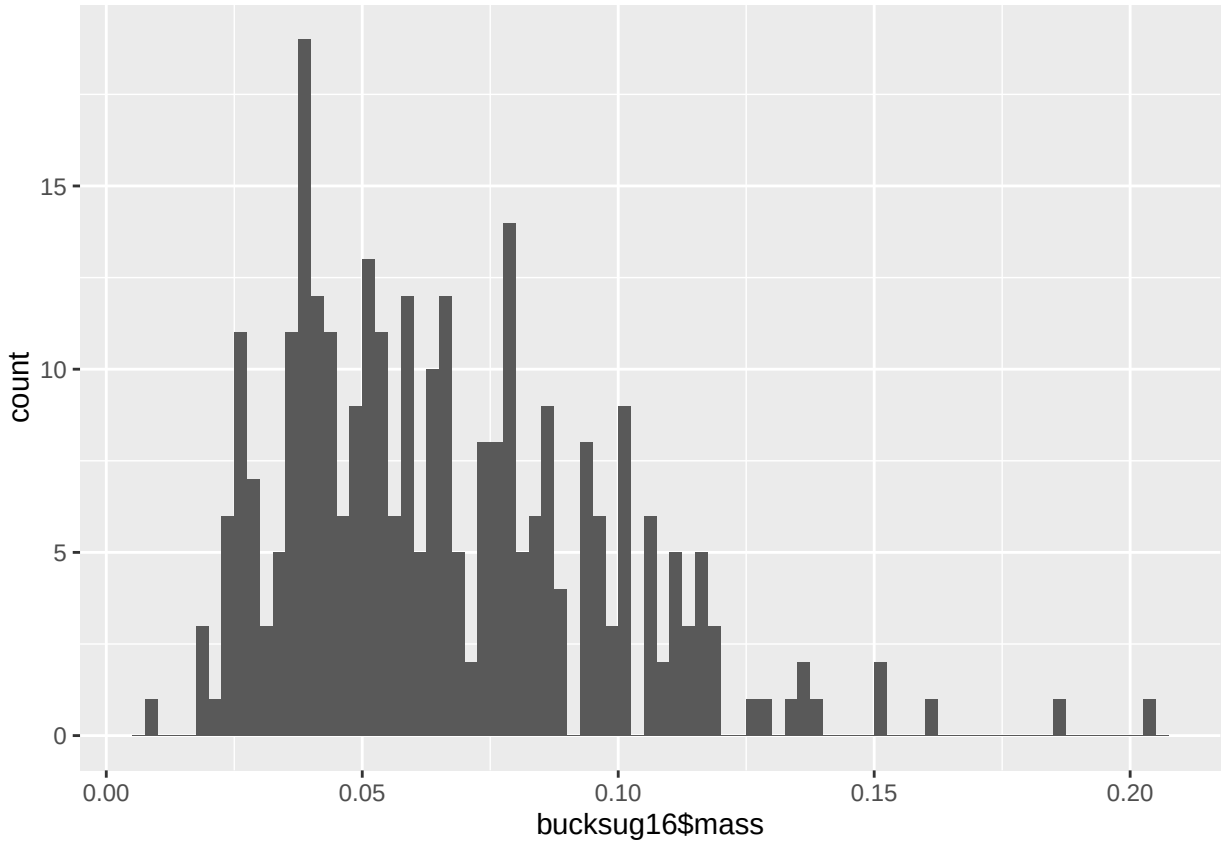

```
qplot(bucksugboth$BRIX, binwidth = 1)
```



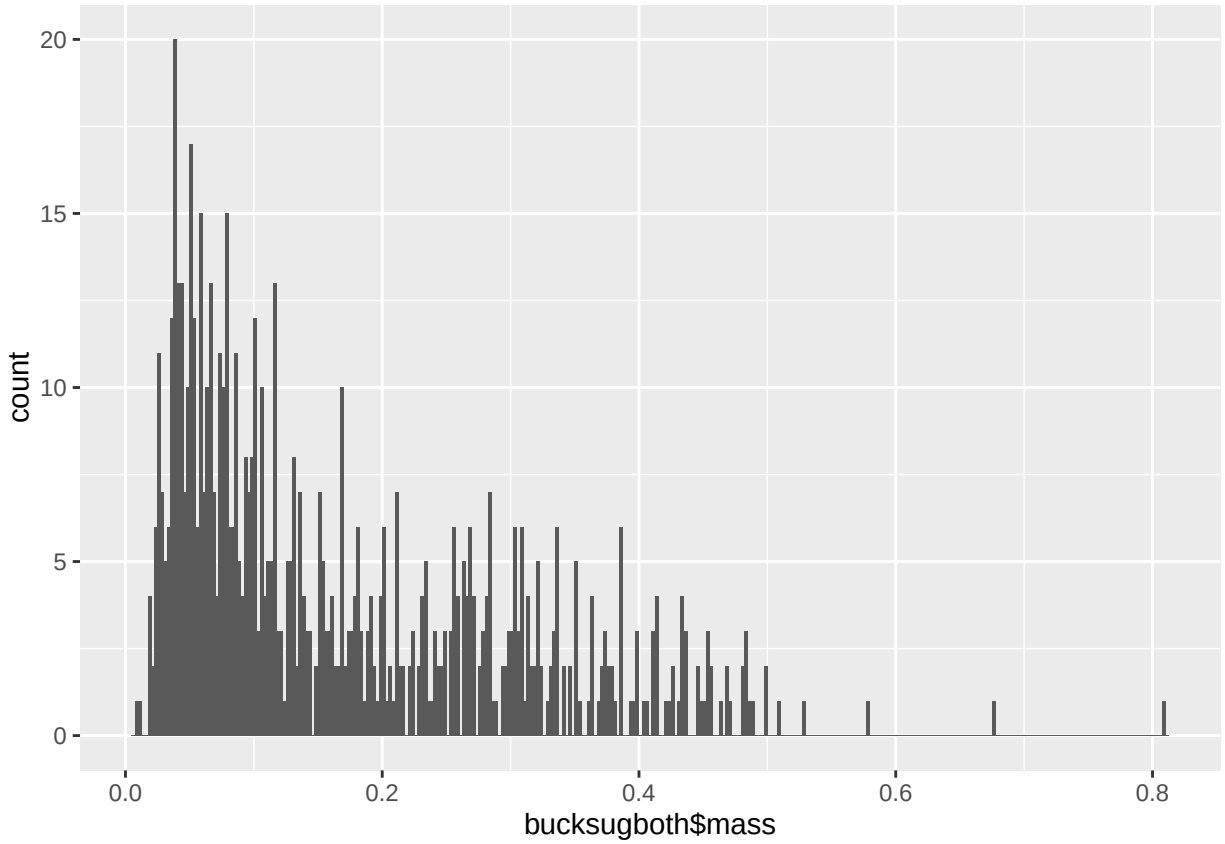

```
qplot(bucksug15$mass, binwidth = 0.005)
```



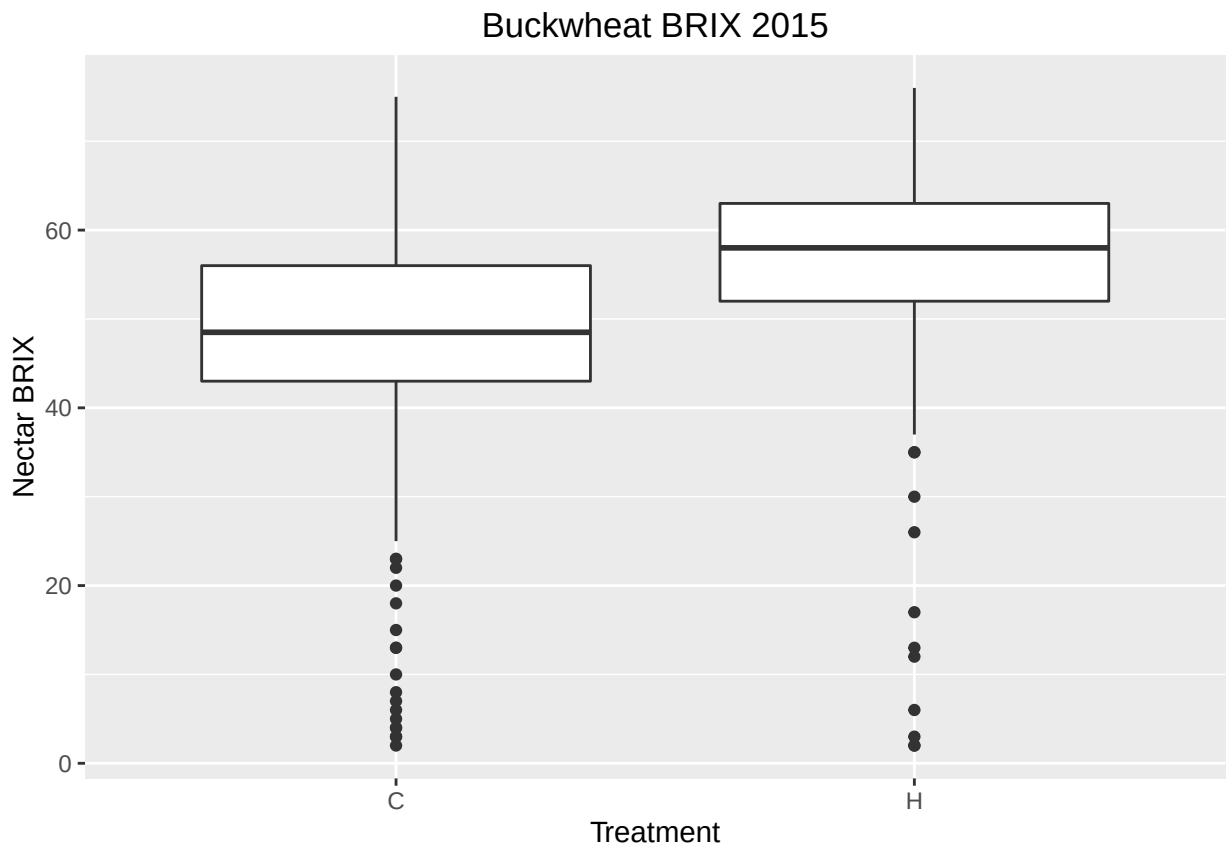

```
qplot(bucksug16$mass, binwidth = .0025)
```



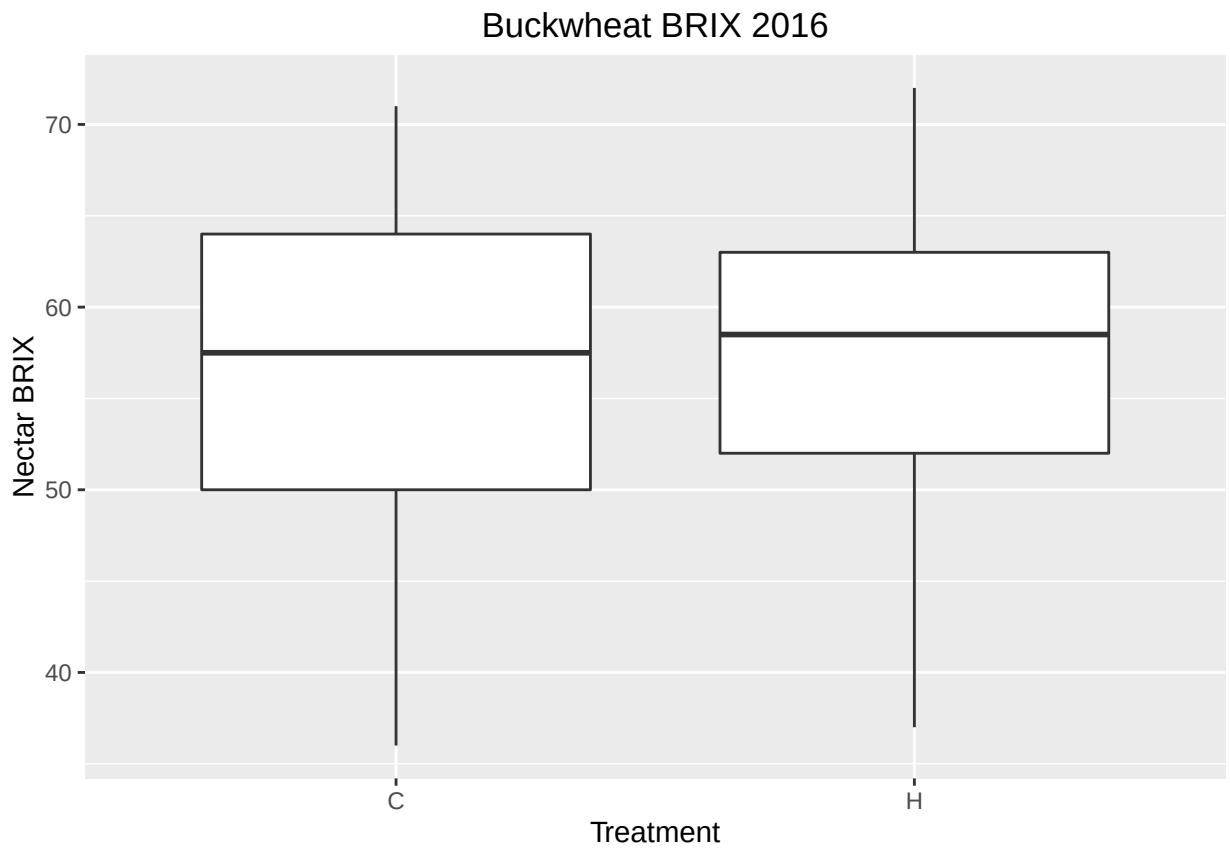

```
qplot(bucksugboth$mass, binwidth = .0025)
```



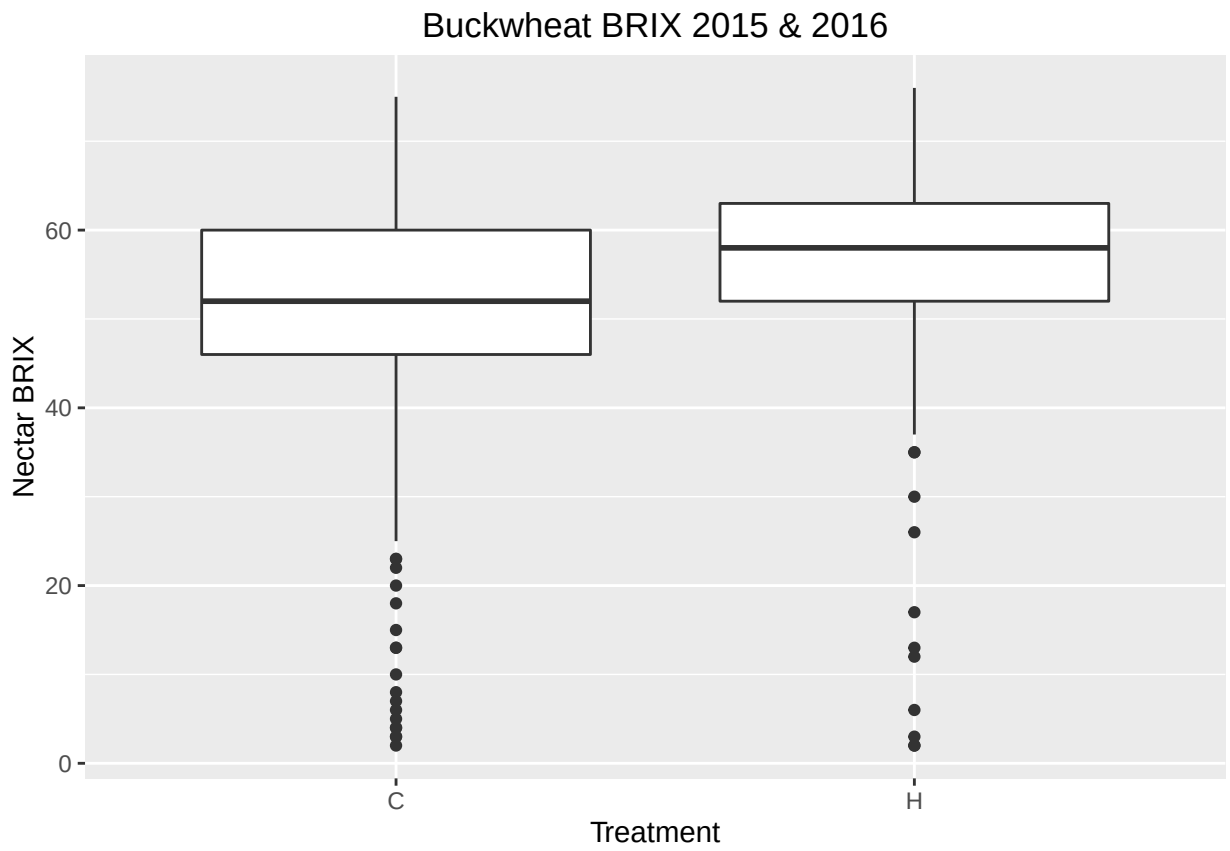

```
ggplot(bucksug15, aes(x=treatment, y=BRIX)) + geom_boxplot() +
  xlab("Treatment") +
  ylab("Nectar BRIX") + ggtitle("Buckwheat BRIX 2015")
```



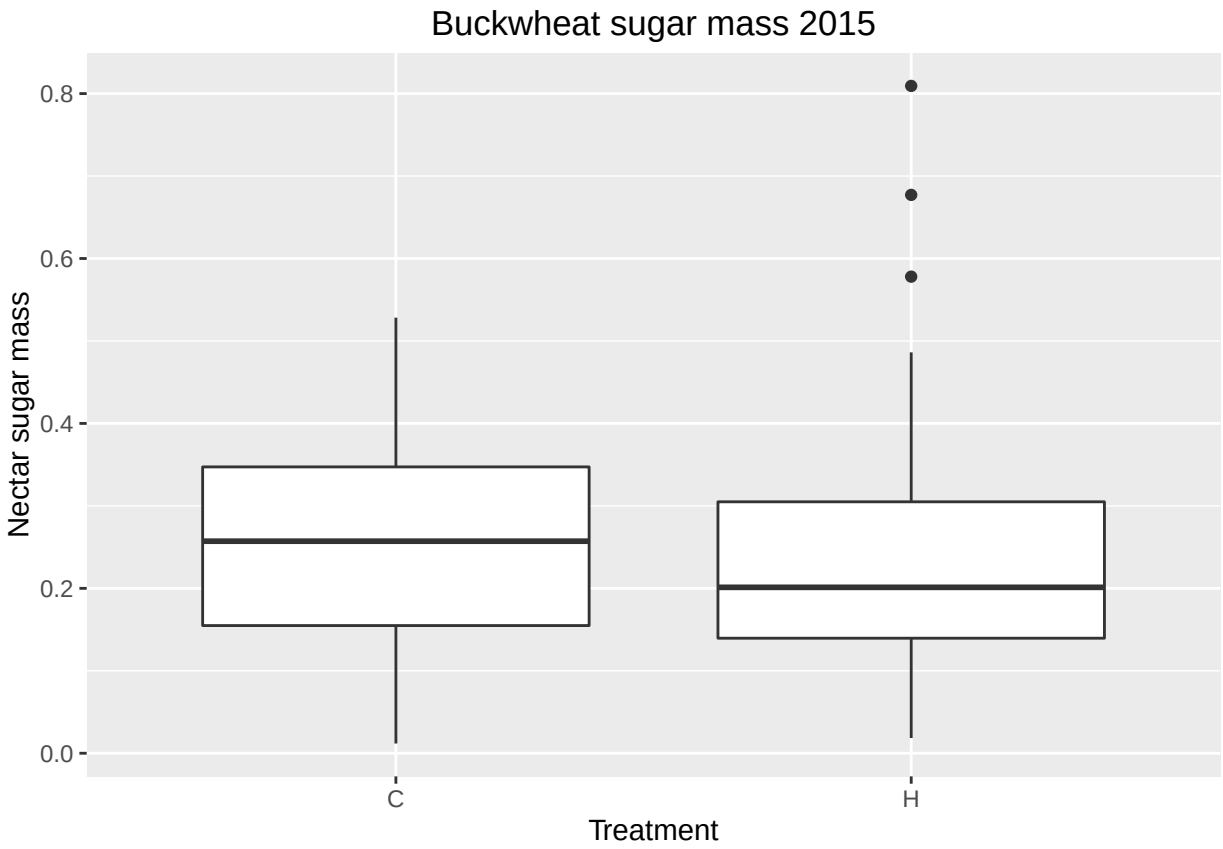

```
ggplot(bucksug16, aes(x=treatment, y=BRIX)) + geom_boxplot() +
  xlab("Treatment") +
  ylab("Nectar BRIX") + ggtitle("Buckwheat BRIX 2016")
```



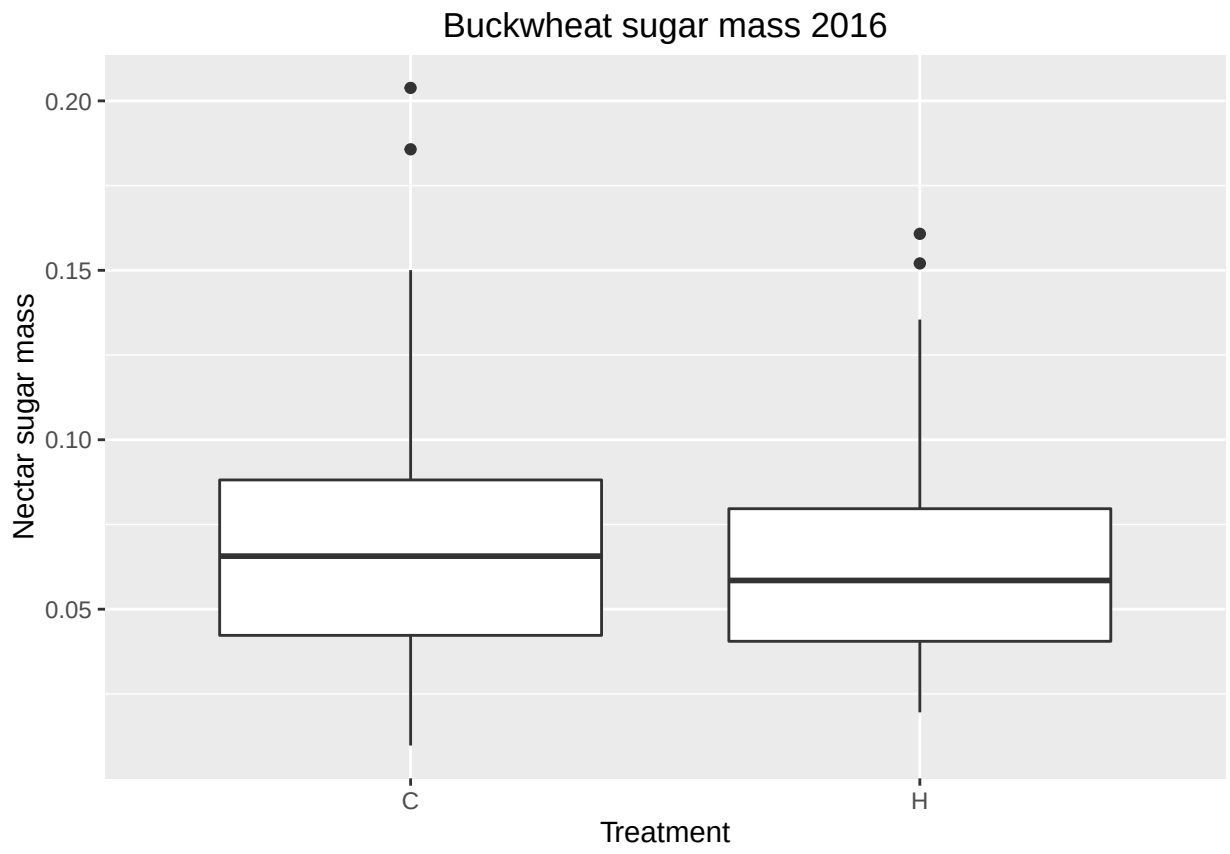

```
ggplot(bucksugboth, aes(x=treatment, y=BRIX)) + geom_boxplot() +
  xlab("Treatment") +
  ylab("Nectar BRIX") + ggtitle("Buckwheat BRIX 2015 & 2016")
```



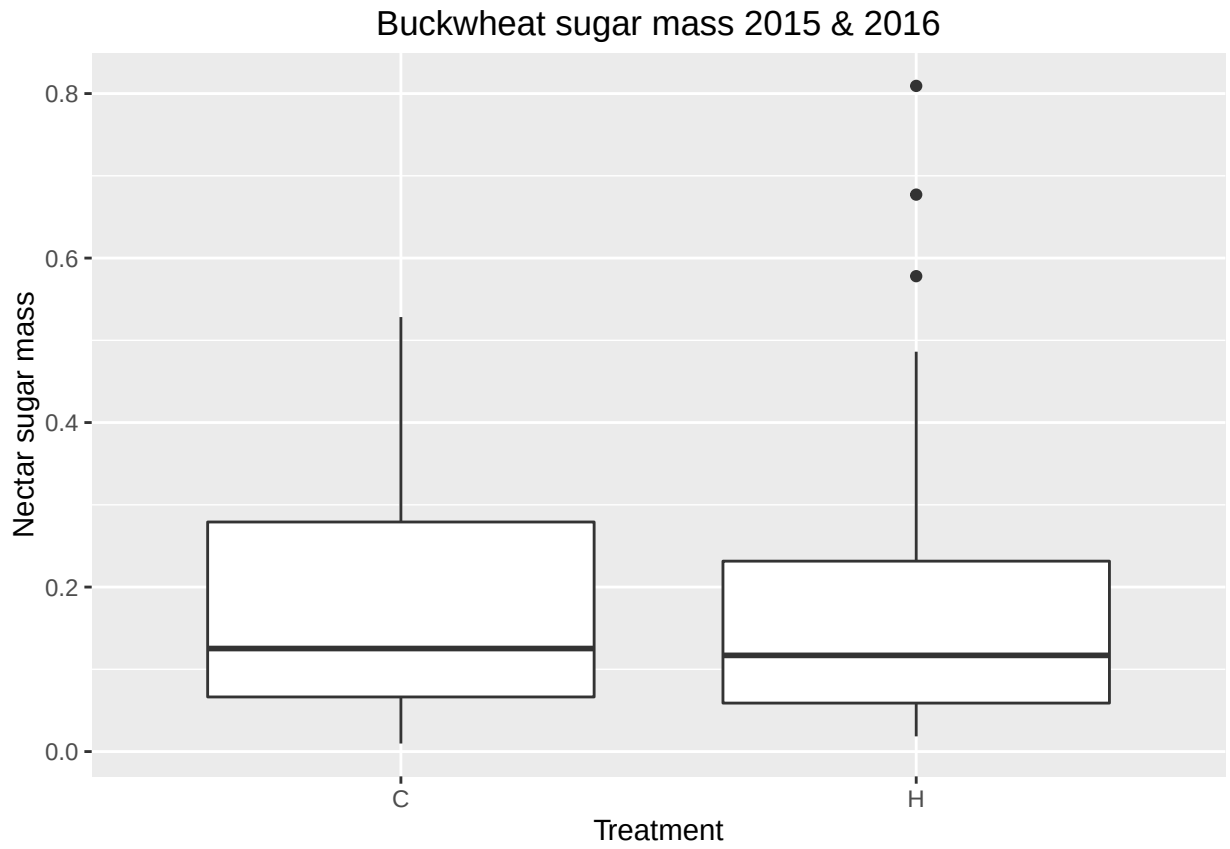

```
ggplot(bucksug15, aes(x=treatment, y=mass)) + geom_boxplot() +
  xlab("Treatment") +
  ylab("Nectar sugar mass") + ggtitle("Buckwheat sugar mass 2015")
```




```
ggplot(bucksug16, aes(x=treatment, y=mass)) + geom_boxplot() +
  xlab("Treatment") +
  ylab("Nectar sugar mass") + ggtitle("Buckwheat sugar mass 2016")
```




```
ggplot(bucksugboth, aes(x=treatment, y=mass)) + geom_boxplot() +
  xlab("Treatment") +
  ylab("Nectar sugar mass") + ggtitle("Buckwheat sugar mass 2015 & 2016")
```




```
# Homoscedastic?

var15C <- sd(bucksug15$BRIX[bucksug15$treatment=="C"])^2
var15H <- sd(bucksug15$BRIX[bucksug15$treatment=="H"])^2
ratio15 <- var15C/var15H
ratio15
```

```
## [1] 1.545888
```

```
var16C <- sd(bucksug16$BRIX[bucksug16$treatment=="C"])^2
var16H <- sd(bucksug16$BRIX[bucksug16$treatment=="H"])^2
ratio16 <- var16C/var16H
ratio16
```

```
## [1] 1.235198
```

```
varbothC <- sd(bucksugboth$BRIX[bucksugboth$treatment=="C"])^2
varbothH <- sd(bucksugboth$BRIX[bucksugboth$treatment=="H"])^2
ratioboth <- varbothC/varbothH
ratioboth
```

```
## [1] 1.720255
```

```
var15C <- sd(bucksug15$mass[bucksug15$treatment=="C"])^2
var15H <- sd(bucksug15$mass[bucksug15$treatment=="H"])^2
ratio15 <- var15C/var15H
ratio15
```

```
## [1] 1.034483
```

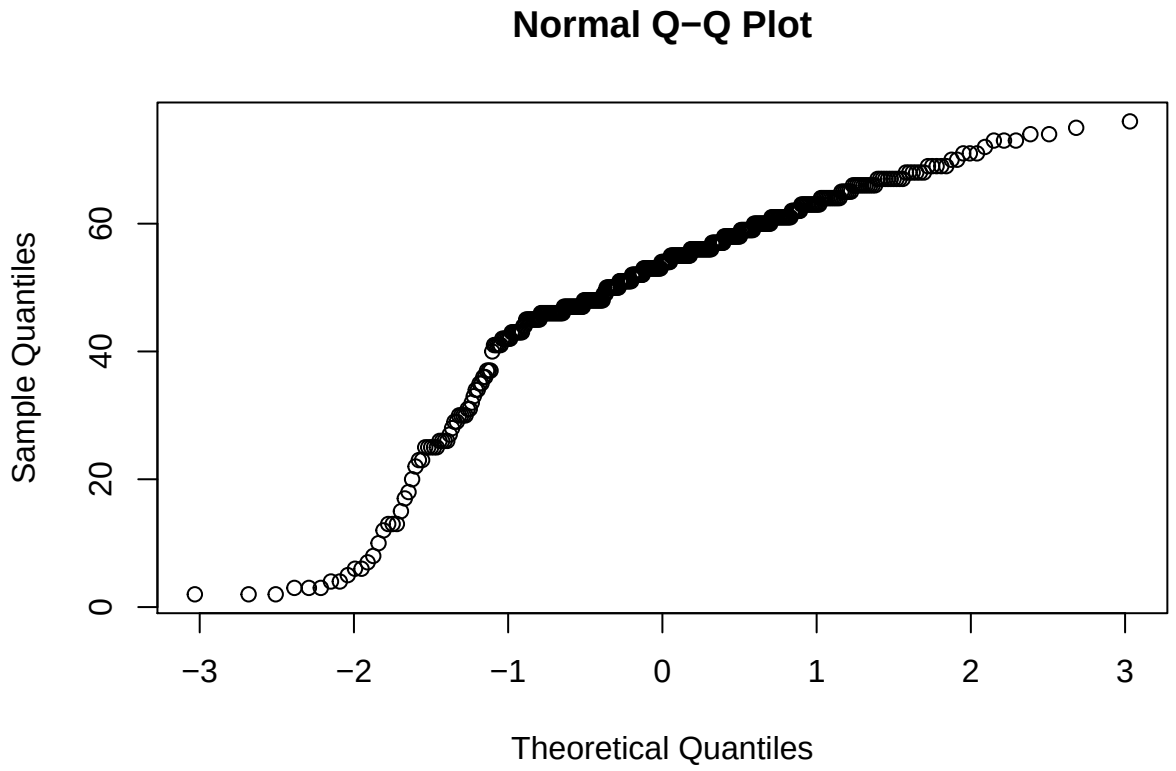
```
var16C <- sd(bucksug16$mass[bucksug16$treatment=="C"])^2
var16H <- sd(bucksug16$mass[bucksug16$treatment=="H"])^2
ratio16 <- var16C/var16H
ratio16
```

```
## [1] 1.257715
```

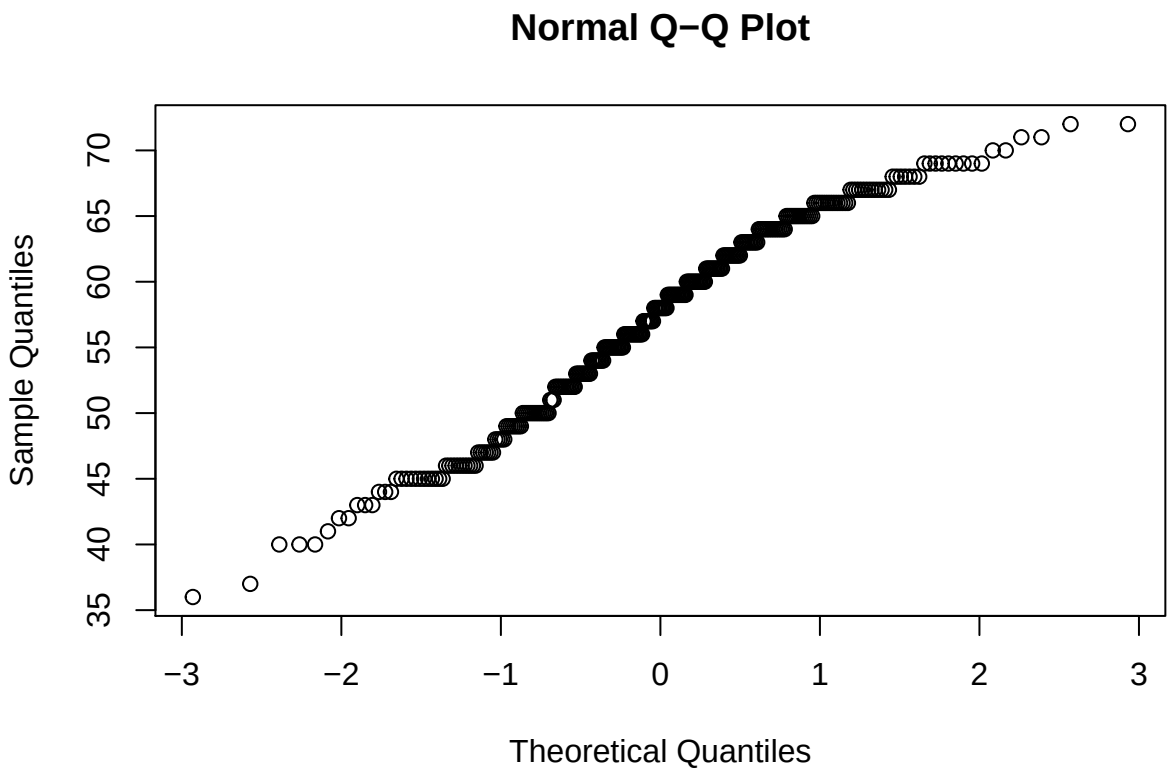
```
varbothC <- sd(bucksugboth$mass[bucksugboth$treatment=="C"])^2
varbothH <- sd(bucksugboth$mass[bucksugboth$treatment=="H"])^2
ratioboth <- varbothC/varbothH
ratioboth
```

```
## [1] 1.141564
```

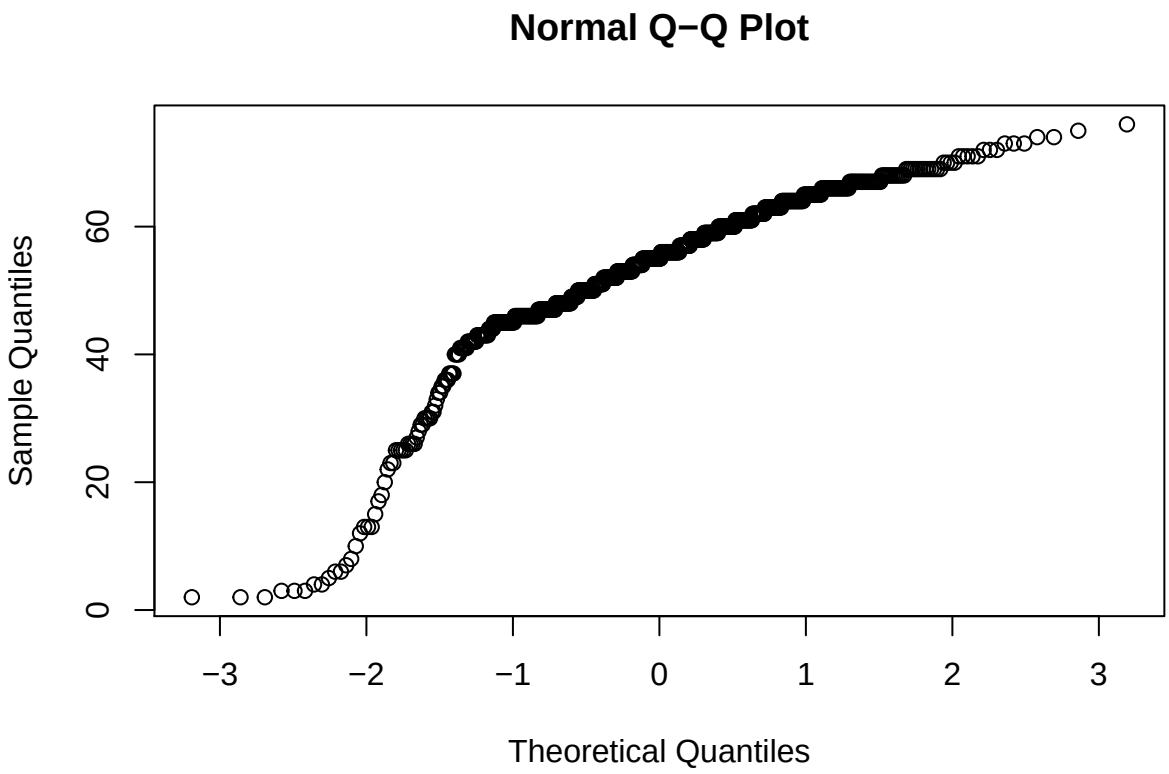
```
# Q-Q plots
qqnorm(bucksug15$BRIX)
```



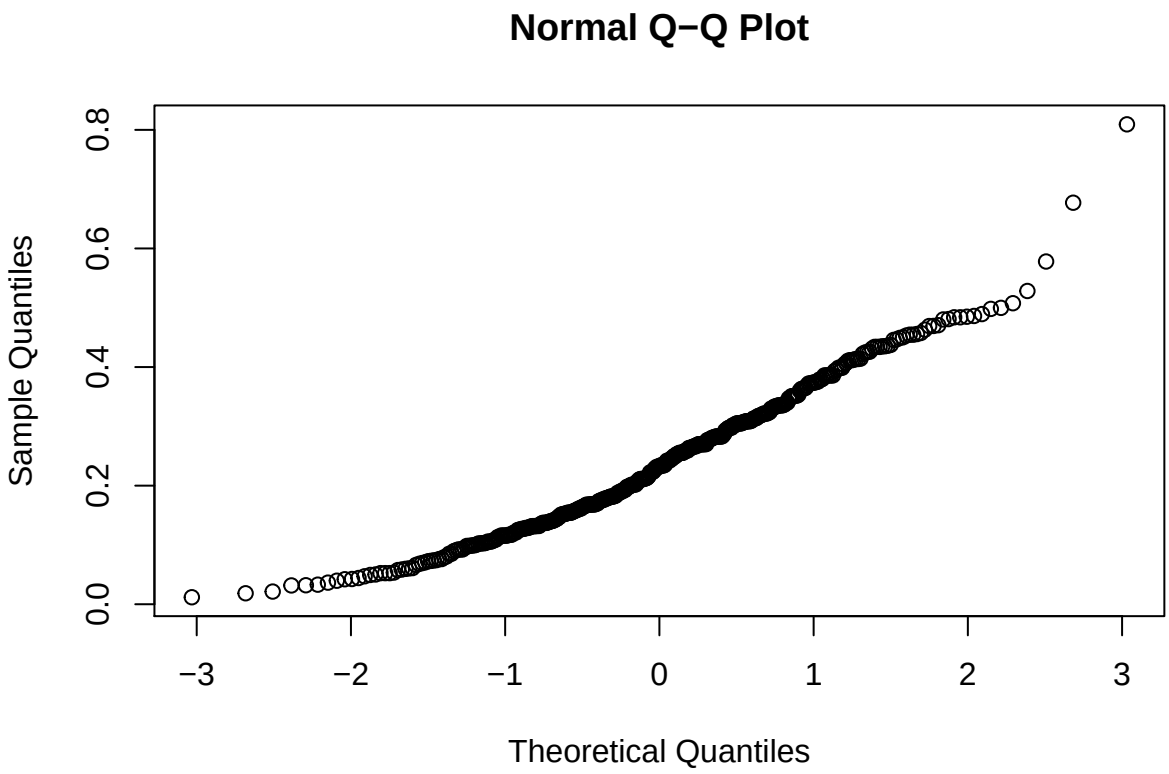
```
qqnorm(bucksug16$BRIX)
```



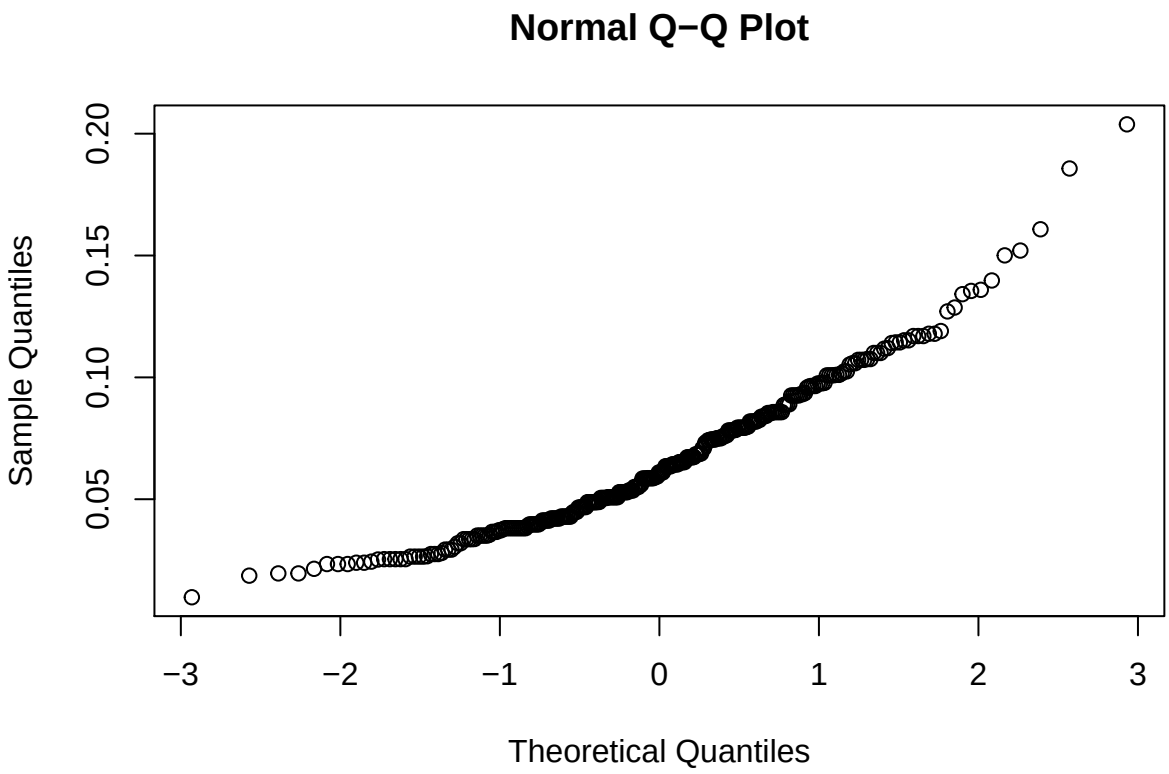

```
qqnorm(bucksugboth$BRIX)
```



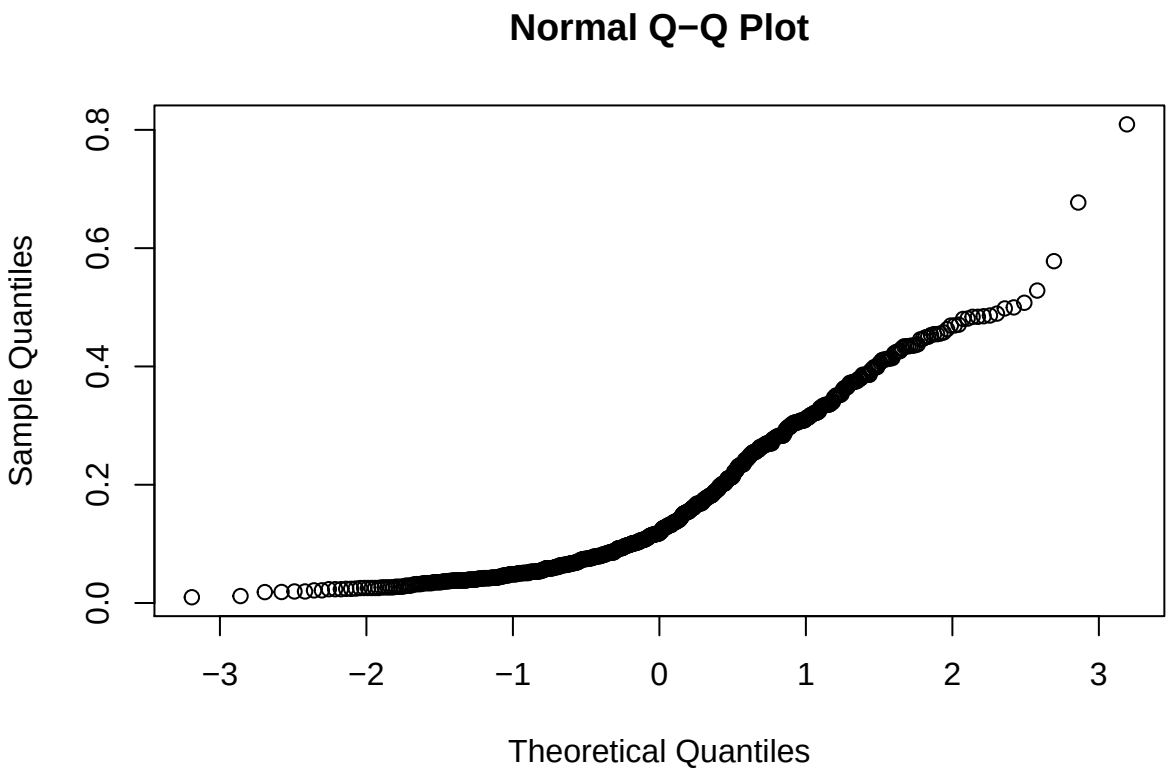

```
qqnorm(bucksug15$mass)
```




```
qqnorm(bucksug16$mass)
```




```
qqnorm(bucksugboth$mass)
```


Normal Q−Q Plot
Sample Quantiles
0.0
0.2
0.4
0.6
0.8
−3
−2
−1
0
1
2
3
Theoretical Quantiles