An Appendix for Tooth Growth Analysis (R codes and figures)

```
data("ToothGrowth")
library(ggplot2)
library(dplyr)
library(knitr)
opts_chunk$set(results = "hide")
#group the data by supp and dose
Tooth_by_Supp_Dose <- ToothGrowth %>%
    group_by(supp, dose)
#change class of dose into factor
Tooth_by_Supp_Dose$dose <- as.factor(Tooth_by_Supp_Dose$dose)
Var_By_Supp <- Tooth_by_Supp_Dose %>%
    group_by(supp, dose) %>%
    summarise(Variance = var(len))
```

summary of the data

```
str(ToothGrowth)
summary(ToothGrowth)
```

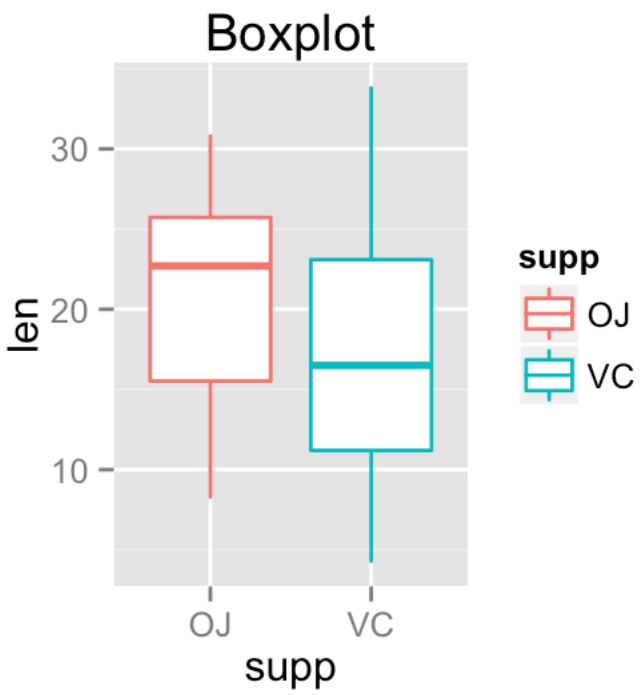
boxplot

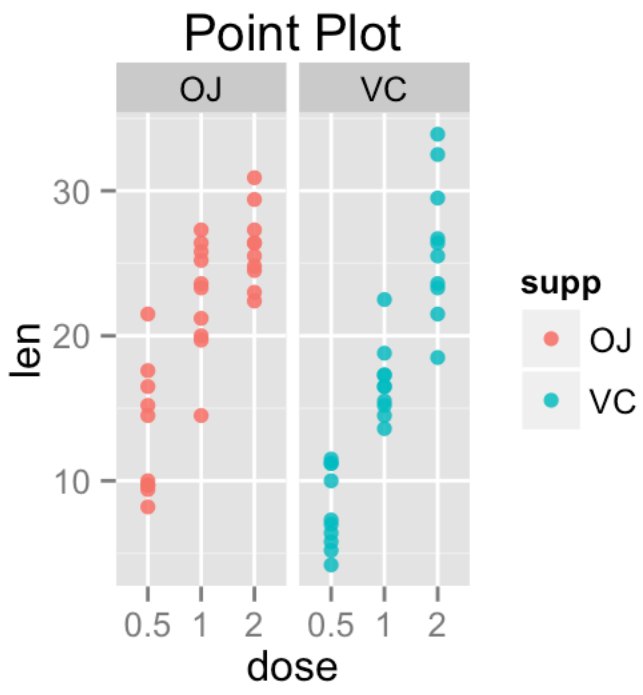
```
par(mfrow = c(2, 2))
summary_plot <- ggplot(data=ToothGrowth, aes(x=supp, y=len)) +
    geom_boxplot(aes(color = supp)) +
    ggtitle("Boxplot")
```

point plot

```
Growth_Plot <- ggplot(data = Tooth_by_Supp_Dose, aes(x=dose, y=len)) +
    geom_point(aes(color=supp), alpha=0.9, size = 2) +
    facet_grid(.~ supp) +
    ggtitle("Point Plot")
```

```
op <- par(mfrow=c(1,2))
summary_plot
Growth_Plot
par(op)
```





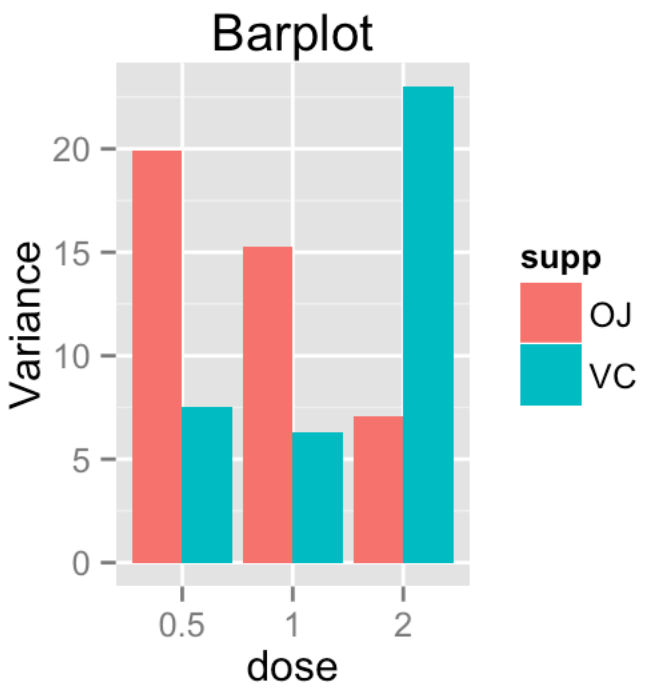
barplot

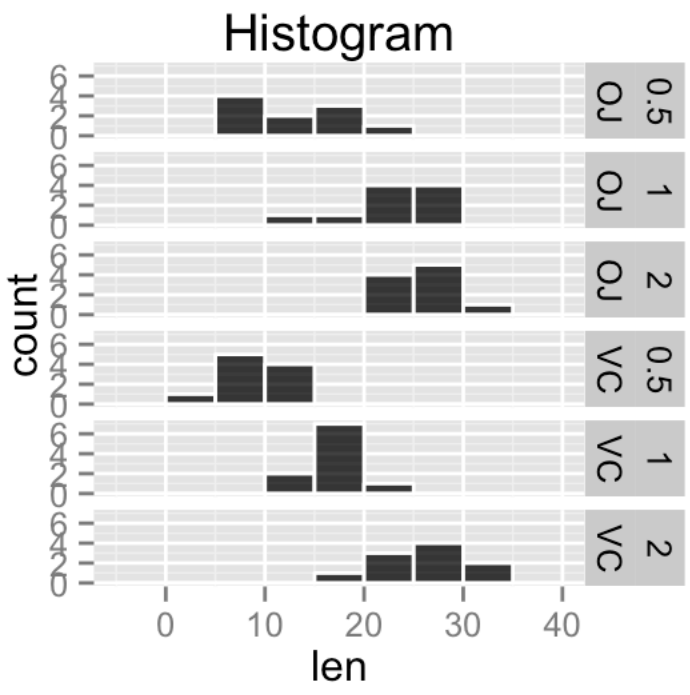
```
Bar_Plot <- ggplot(data=Var_By_Supp,aes(x=dose, y = Variance)) +
    geom_bar(aes(fill = supp), position = "dodge", stat="identity") +
    ggtitle("Barplot")
```

histogram of variances

```
#So variances are equal.
Hist_Plot <- ggplot(data= Tooth_by_Supp_Dose, aes(len)) +
    geom_histogram(binwidth=5,colour = "white",fill = "black",alpha=0.8) +
    facet_grid(supp + dose ~ .) +
    ggtitle("Histogram")
#the assumption that the data distributed in the shape of mound is acceptable, since
each unite of observations is identical and randomly chosen.
```

```
op <- par(mfrow=c(1,2))
Bar_Plot
Hist_Plot
par(op)
```





The t test on the group (OJ, 0.5) and the group (VC, 0.5):

```
Dose_0.5 <- filter(ToothGrowth, dose == 0.5)
test_0.5 <- t.test(len ~ supp, paired = FALSE, var.equal = FALSE, data = Dose_0.5)
test_0.5
```

The t test on the group (OJ, 1) and the group (VC, 1):

```
Dose_1.0 <- filter(ToothGrowth, dose == 1.0)
test_1.0 <- t.test(len ~ supp, paired = FALSE, var.equal = FALSE, data = Dose_1.0)
test_1.0
```

The t test on the group (OJ, 2) and the group (VC, 2):

```
Dose_2.0 <- filter(ToothGrowth, dose == 2.0)
test_2.0 <- t.test(len ~ supp, paired = FALSE, var.equal = FALSE, data = Dose_2.0)
test_2.0
```