# clase-6.R

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```
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# Clase 6


arena <- c(6, 10, 8, 6, 14, 17, 9, 11, 7, 11)
arcilla <- c(17, 15, 3, 11, 14, 12, 12, 8, 10, 13)
limo <- c(13, 16, 9, 12, 15, 16, 17, 13, 18, 14)


y.ton <- c(arena, arcilla, limo)

suelo <-gl(3, 10, 30, labels=c("arena", "arcilla", "limo"))
prod <- data.frame(suelo, y.ton)
head(prod)
```

```
##   suelo y.ton
## 1 arena     6
## 2 arena    10
## 3 arena     8
## 4 arena     6
## 5 arena    14
## 6 arena    17
```

```
tapply(prod$y.ton, prod$suelo, mean)
```

```
##   arena arcilla    limo
##     9.9    11.5    14.3
```

```
tapply(prod$y.ton, prod$suelo, var)
```

```
##     arena   arcilla      limo
## 12.544444 15.388889  7.122222
```

```
# pruebas de varianza ----------------------------------------------------


shapiro.test(prod$y.ton)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  prod$y.ton
## W = 0.97214, p-value = 0.5993
```

```
# los ddatos provienen de una distribucion normal

bartlett.test(prod$y.ton, prod$suelo)
```

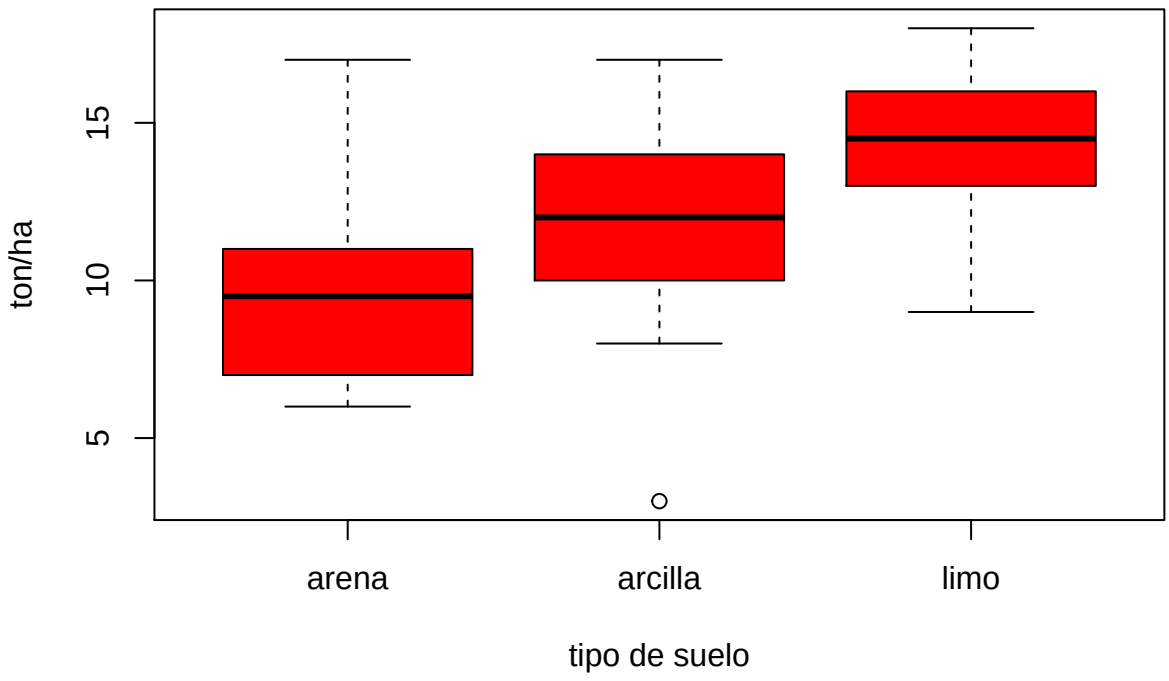
```
##
```

```
##  Bartlett test of homogeneity of variances
##
## data:  prod$y.ton and prod$suelo
## Bartlett's K-squared = 1.2764, df = 2, p-value = 0.5283
```

```
# para determinar la homeginedad de varaianzas


# visualizacion de los datos  ------------------------------------------

boxplot(prod$y.ton ~ prod$suelo, xlab = "tipo de suelo", ylab = "ton/ha", col="red")
```



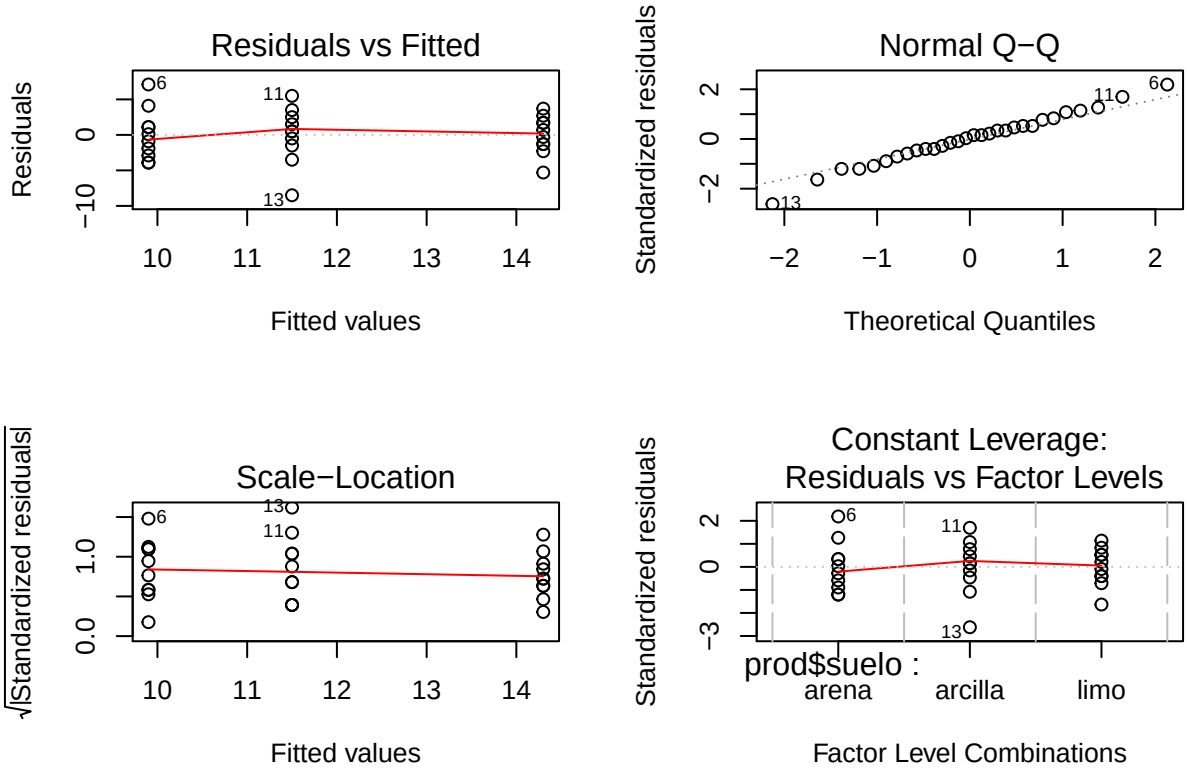

```
aov.suelo <- aov(prod$y.ton ~ prod$suelo)
aov.suelo
```

```
## Call:
##    aov(formula = prod$y.ton ~ prod$suelo)
##
## Terms:
##                 prod$suelo Residuals
## Sum of Squares        99.2     315.5
## Deg. of Freedom          2        27
##
## Residual standard error: 3.41836
## Estimated effects may be unbalanced
```

```
summary(aov.suelo)
```

```
##             Df Sum Sq Mean Sq F value Pr(>F)
## prod$suelo   2   99.2   49.60   4.245  0.025 *
## Residuals   27  315.5   11.69
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
par(mfrow=c(2,2))
plot(aov(prod$y.ton ~ prod$suelo))
```

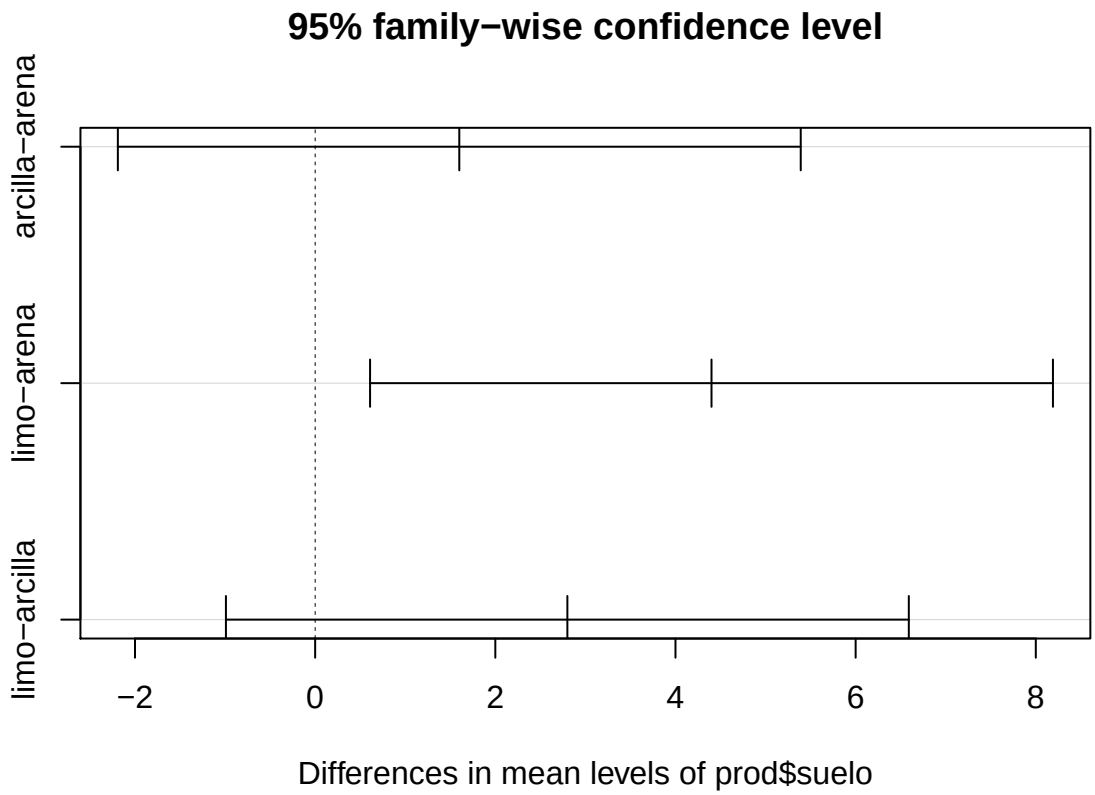



```
par(mfrow=c(1,1))


TukeyHSD(aov.suelo, conf.level = 0.95)
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = prod$y.ton ~ prod$suelo)
##
## $`prod$suelo`
##                diff        lwr      upr     p adj
## arcilla-arena   1.6 -2.1903777 5.390378 0.5546301
## limo-arena      4.4  0.6096223 8.190378 0.0204414
## limo-arcilla    2.8 -0.9903777 6.590378 0.1785489
```

```r
plot(TukeyHSD(aov.suelo))
```




```r
summary.lm(aov.suelo)
```

```
##
## Call:
## aov(formula = prod$y.ton ~ prod$suelo)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##   -8.5   -1.8    0.3    1.7    7.1
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)          9.900      1.081   9.158 9.04e-10 ***
## prod$sueloarcilla    1.600      1.529   1.047  0.30456
## prod$suelolimo       4.400      1.529   2.878  0.00773 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.418 on 27 degrees of freedom
## Multiple R-squared:  0.2392, Adjusted R-squared:  0.1829
## F-statistic: 4.245 on 2 and 27 DF,  p-value: 0.02495
```

```r
# el analisis de varianza es significativo

# HÂ° que la produccion en toneladas de ceral es el mismo
```

```
# en los tres tipos de suelo.

# H1 que al menos uno de los tratamientos es diferente
```