

# DA\_ANOVA.R

USUARIO

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```
# Enilton Mauricio Avendaño Amaya  
# 2022601  
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```

```
# Ingresar datos -----
```

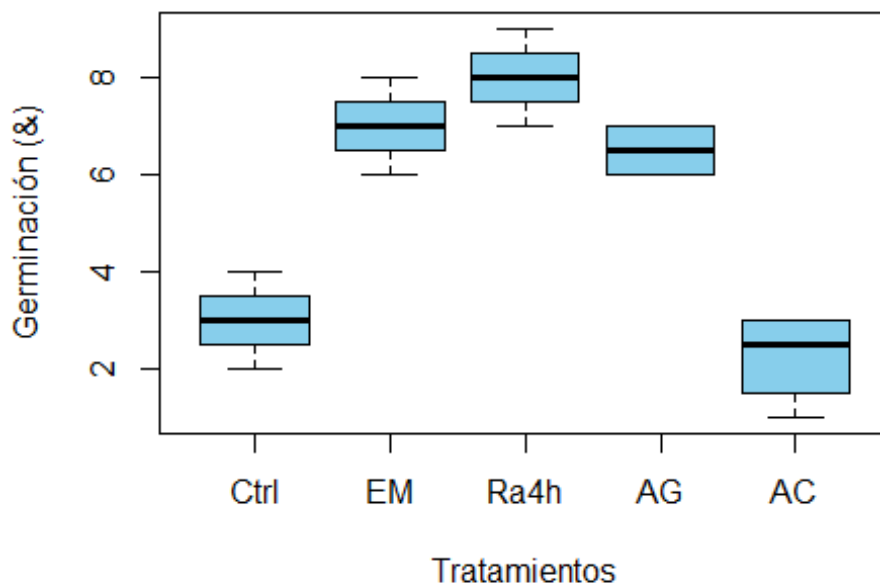
```
# Ingresar datos del diseño aleatorio  
# 5 tratamientos germinativos  
# 4 repeticiones por tratamiento
```

```
germ <- c(3,3, 4, 2, 7, 8, 7, 6, 8, 9, 8, 7, 6, 7, 7, 6, 3, 2, 1, 3)
```

```
trat <- gl(5, 4, 20, labels = c("Ctrl", "EM", "Ra4h", "AG", "AC"))
```

```
Exper <- data.frame(trat, germ)
```

```
boxplot(Exper$germ ~ Exper$trat, col = "skyblue",  
        xlab = "Tratamientos", ylab = "Germinación (&"))
```



*#Revisión de datos*

```
shapiro.test(Exper$germ)
```

```
##
```

```
## Shapiro-Wilk normality test
```

```
##
```

```
## data: Exper$germ
```

```
## W = 0.90183, p-value = 0.04462
```

*#Revisa la igualdad de varianzas*

```
bartlett.test(Exper$germ, Exper$trat)
```

```
##
```

```
## Bartlett test of homogeneity of variances
```

```
##
```

```
## data: Exper$germ and Exper$trat
```

```
## Bartlett's K-squared = 0.65675, df = 4, p-value = 0.9566
```

```
med.trat <- tapply(Exper$germ, Exper$trat, mean)
```

```
med.trat
```

```
## Ctrl EM Ra4h AG AC
```

```
## 3.00 7.00 8.00 6.50 2.25
```

*# Media general*

```
MG <- mean(Exper$germ)
```

```

var.trat <- tapply(Exper$germ, Exper$trat, var)
var.trat

##          Ctrl          EM          Ra4h          AG          AC
## 0.6666667 0.6666667 0.6666667 0.3333333 0.9166667

Exper$SC <- (Exper$germ - MG)^2

# Suma de cuadrados del tratamiento SCTol
SCTol <- sum(Exper$SC)

# Suma de cuadrados del tratamiento SCTrat

SCTrat <- sum((med.trat-MG)^2 * 4)
SCTrat

## [1] 104.8

# Suma cuadrado del error
SCTol - SCTrat

## [1] 9.75

SCTrat/4

## [1] 26.2

9.7/15

## [1] 0.6466667

26.2/0.64

## [1] 40.9375

# ANOVA usando función aov

Exp.aov <- aov(Exper$germ ~ Exper$trat)
summary(Exp.aov)

##              Df Sum Sq Mean Sq F value    Pr(>F)
## Exper$trat    4 104.80   26.20   40.31 7.42e-08 ***
## Residuals   15   9.75    0.65
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Existen diferencias entre los tart de germ
# Por lo tanto, aplicaremos una prueba de Tukey

TukeyHSD(Exp.aov)

##      Tukey multiple comparisons of means
##      95% family-wise confidence level

```

```
##
## Fit: aov(formula = Exper$germ ~ Exper$trat)
##
## `$Exper$trat`
##      diff      lwr      upr      p adj
## EM-Ctrl    4.00  2.2396122  5.7603878 0.0000356
## Ra4h-Ctrl   5.00  3.2396122  6.7603878 0.0000024
## AG-Ctrl     3.50  1.7396122  5.2603878 0.0001587
## AC-Ctrl    -0.75 -2.5103878  1.0103878 0.6862491
## Ra4h-EM     1.00 -0.7603878  2.7603878 0.4332120
## AG-EM      -0.50 -2.2603878  1.2603878 0.9009428
## AC-EM      -4.75 -6.5103878 -2.9896122 0.0000045
## AG-Ra4h    -1.50 -3.2603878  0.2603878 0.1140897
## AC-Ra4h    -5.75 -7.5103878 -3.9896122 0.0000004
## AC-AG      -4.25 -6.0103878 -2.4896122 0.0000175

plot(TukeyHSD(Exp.aov))
```

### 95% family-wise confidence level

