

# Tarea\_diplomado\_Paula

Paula Celis Plá

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## Habilita Librerías

### Summary

```
summary(cars)
```

```
##      speed      dist
## Min.   : 4.0    Min.   :  2.00
## 1st Qu.:12.0    1st Qu.: 26.00
## Median :15.0    Median : 36.00
## Mean   :15.4    Mean    : 42.98
## 3rd Qu.:19.0    3rd Qu.: 56.00
## Max.   :25.0    Max.    :120.00
```

### Variables categoricas Seasons, time, hours y replicate asigna factor

```
Datos_Proyecto <- read_excel("Datos_Proyecto.xlsx")
summary(Datos_Proyecto)
```

```
##      Seasons      time      Replicate      Chla
## Length:108      Length:108      Length:108      Min.   :0.6730
## Class :character Class :character Class :character 1st Qu.:0.9888
## Mode  :character Mode  :character Mode  :character Median :1.1660
##                                     Mean   :1.1856
##                                     3rd Qu.:1.3813
##                                     Max.   :1.9690
##      Chlc      Car      PC      DPPH
## Min.   :0.01000 Min.   :0.4190 Min.   : 4.600 Min.   : 3.792
## 1st Qu.:0.06775 1st Qu.:0.6240 1st Qu.: 9.953 1st Qu.: 6.539
## Median :0.09500 Median :0.7520 Median :13.815 Median : 7.769
## Mean   :0.09365 Mean   :0.7557 Mean   :15.153 Mean   : 7.444
## 3rd Qu.:0.10975 3rd Qu.:0.8780 3rd Qu.:18.990 3rd Qu.: 8.433
## Max.   :0.22100 Max.   :1.2080 Max.   :37.340 Max.   :10.097
##      Temperature      pH      Salinity      PAR
## Min.   :11.54 Min.   :7.620 Min.   :16.44 Min.   : 9.768
## 1st Qu.:12.29 1st Qu.:7.850 1st Qu.:29.62 1st Qu.:196.000
## Median :12.88 Median :7.960 Median :34.10 Median :525.793
## Mean   :13.98 Mean   :7.982 Mean   :30.49 Mean   :569.983
## 3rd Qu.:15.35 3rd Qu.:8.150 3rd Qu.:34.63 3rd Qu.:764.500
## Max.   :18.02 Max.   :8.500 Max.   :34.90 Max.   :1921.000
```

## Transforma variables a factores

```
Datos_Proyecto$Seasons <- as.factor(Datos_Proyecto$Seasons)
Datos_Proyecto$time <- as.factor(Datos_Proyecto$time)
Datos_Proyecto$Replicate <- as.factor(Datos_Proyecto$Replicate)
```

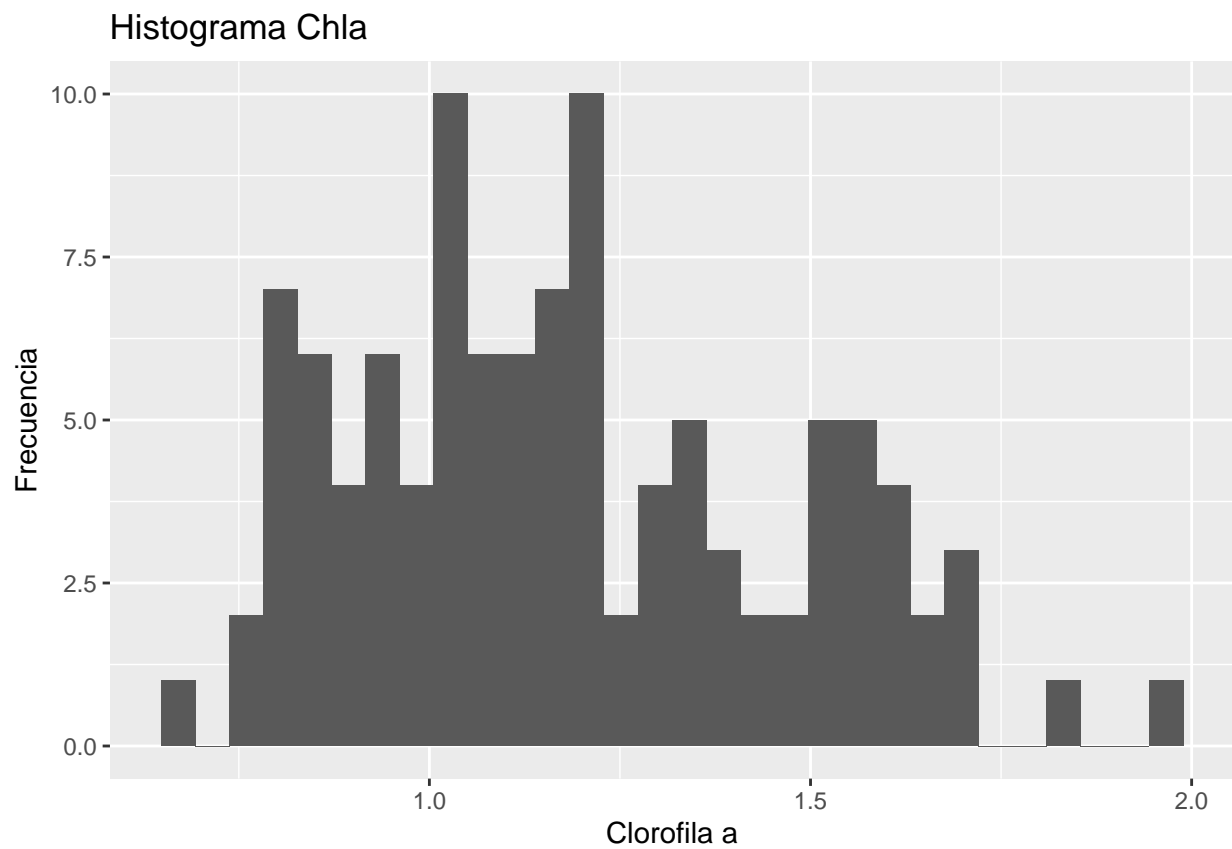
```
summary(Datos_Proyecto)
```

```
##      Seasons      time      Replicate      Chla      Chlc
## Autumn:27 day 1:36 R1 :12 Min. :0.6730 Min. :0.01000
## Spring:27 day 2:36 R2 :12 1st Qu.:0.9888 1st Qu.:0.06775
## Summer:27 day 3:36 R3 :12 Median :1.1660 Median :0.09500
## Winter:27 R4 :12 Mean :1.1856 Mean :0.09365
## R5 :12 3rd Qu.:1.3813 3rd Qu.:0.10975
## R6 :12 Max. :1.9690 Max. :0.22100
## (Other):36
##      Car      PC      DPPH      Temperature
## Min. :0.4190 Min. : 4.600 Min. : 3.792 Min. :11.54
## 1st Qu.:0.6240 1st Qu.: 9.953 1st Qu.: 6.539 1st Qu.:12.29
## Median :0.7520 Median :13.815 Median : 7.769 Median :12.88
## Mean :0.7557 Mean :15.153 Mean : 7.444 Mean :13.98
## 3rd Qu.:0.8780 3rd Qu.:18.990 3rd Qu.: 8.433 3rd Qu.:15.35
## Max. :1.2080 Max. :37.340 Max. :10.097 Max. :18.02
##
##      pH      Salinity      PAR
## Min. :7.620 Min. :16.44 Min. : 9.768
## 1st Qu.:7.850 1st Qu.:29.62 1st Qu.:196.000
## Median :7.960 Median :34.10 Median :525.793
## Mean :7.982 Mean :30.49 Mean :569.983
## 3rd Qu.:8.150 3rd Qu.:34.63 3rd Qu.:764.500
## Max. :8.500 Max. :34.90 Max. :1921.000
##
```

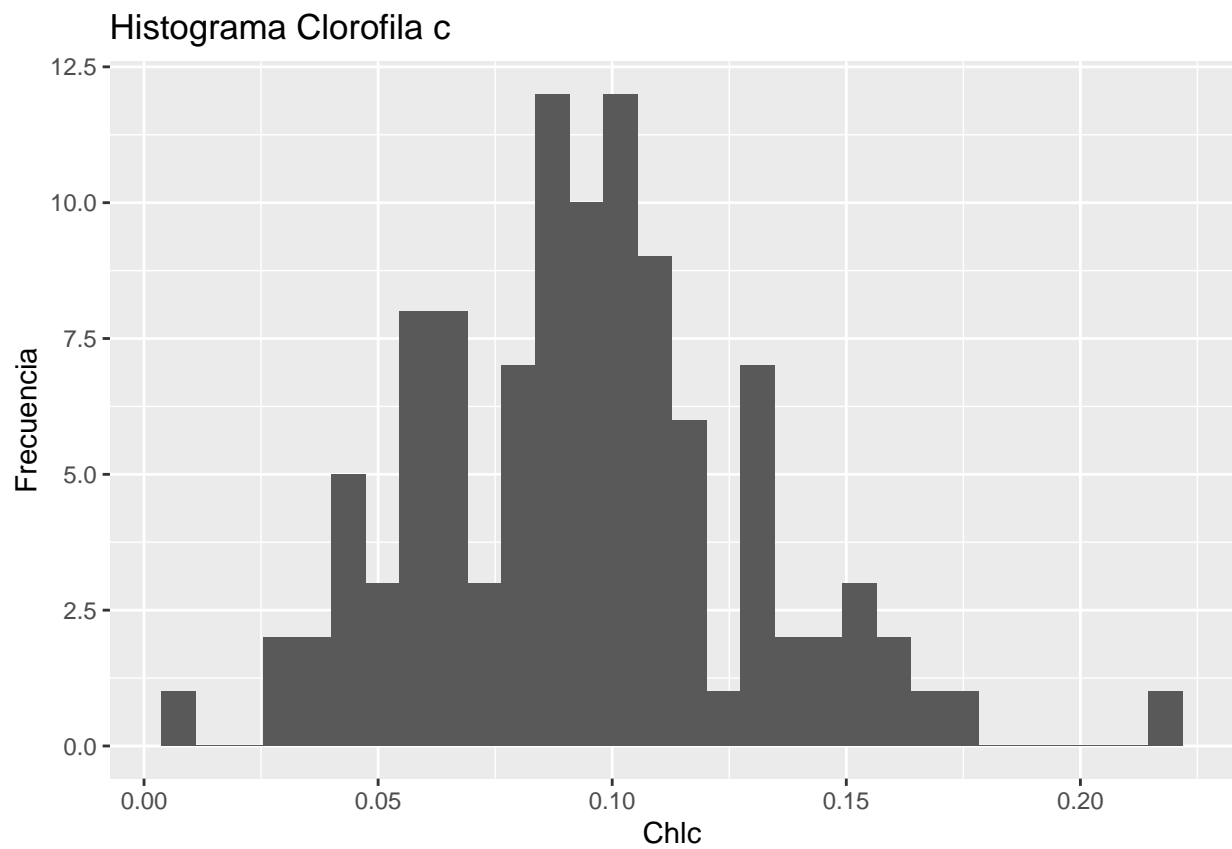
## Including Plots

### 3. Histogramas con etiquetas y títulos

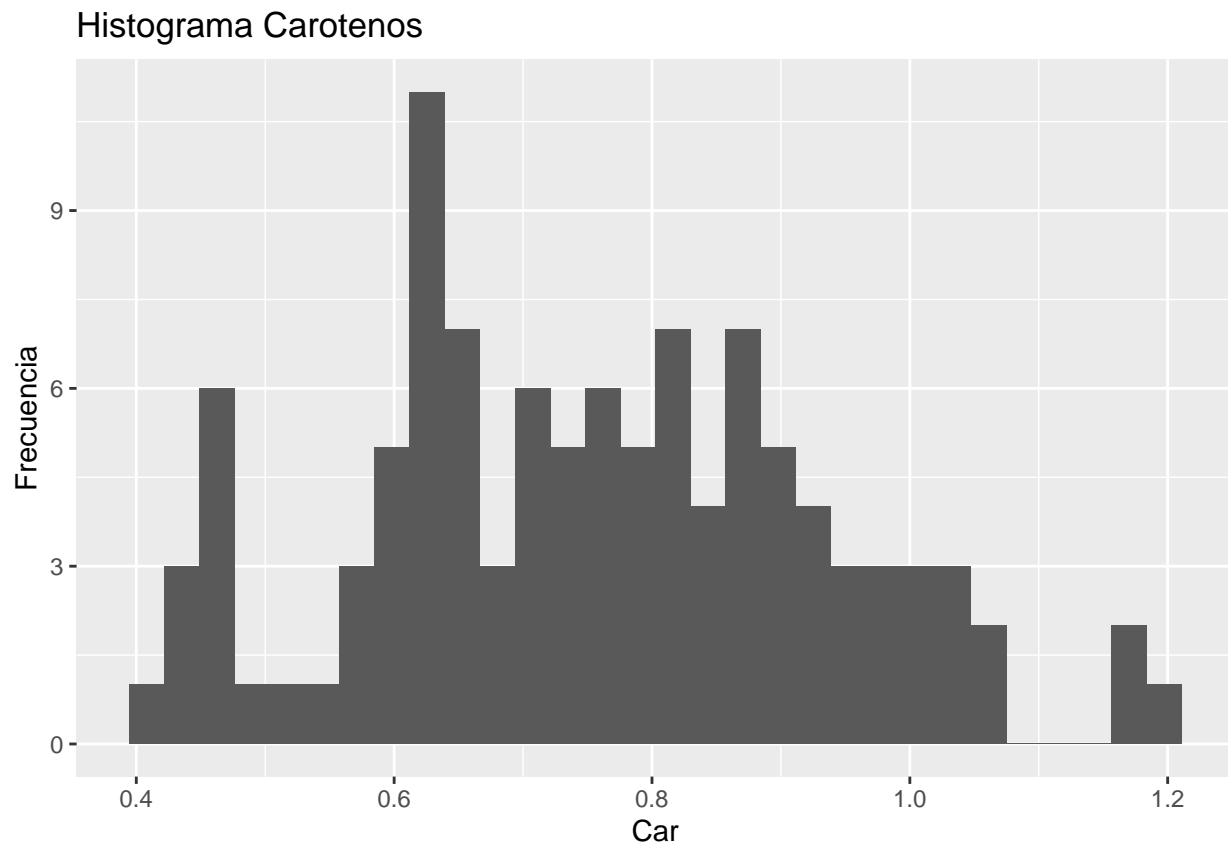
```
ggplot(Datos_Proyecto, aes(Chla)) + geom_histogram() + labs(title="Histograma Chla", x="Clorofila a", y=
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



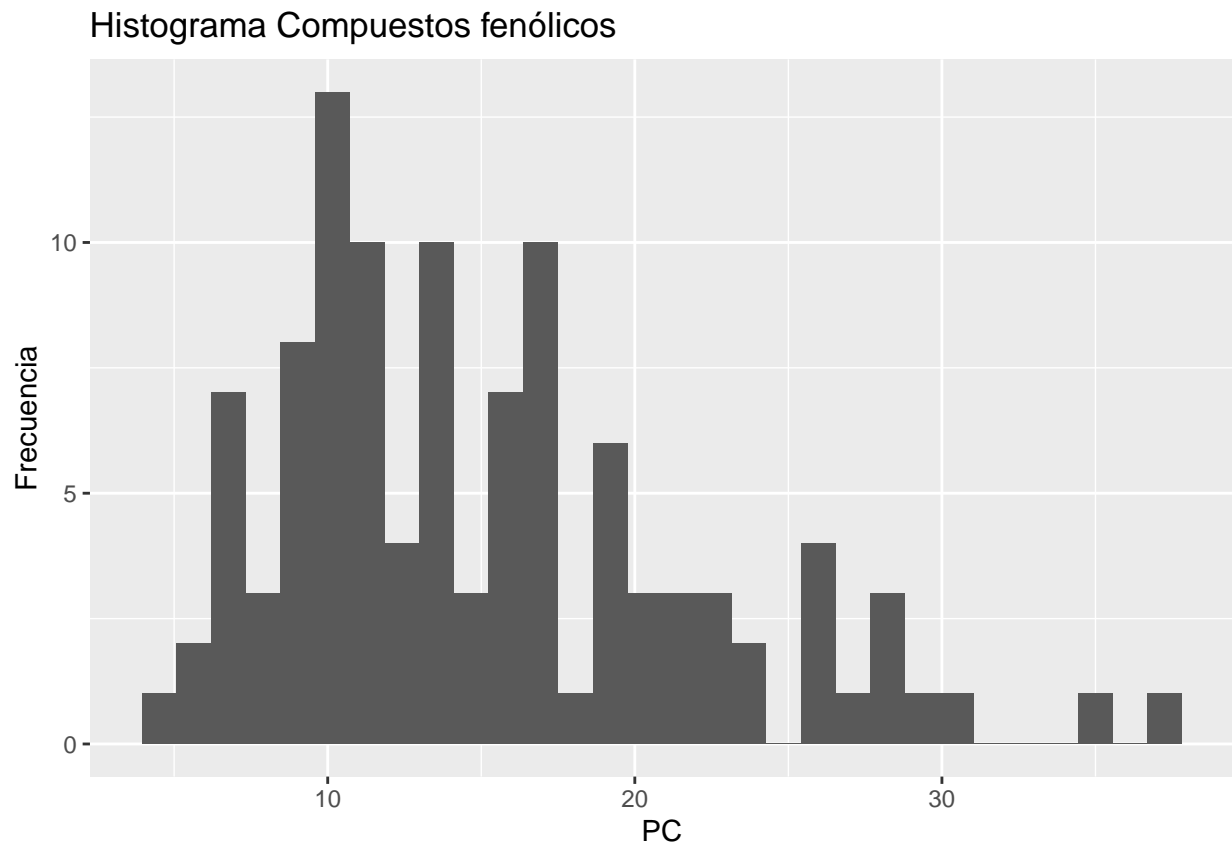
```
ggplot(Datos_Proyecto, aes(Chlc)) + geom_histogram()+ labs(title="Histograma Clorofila c", x="Chlc", y=
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



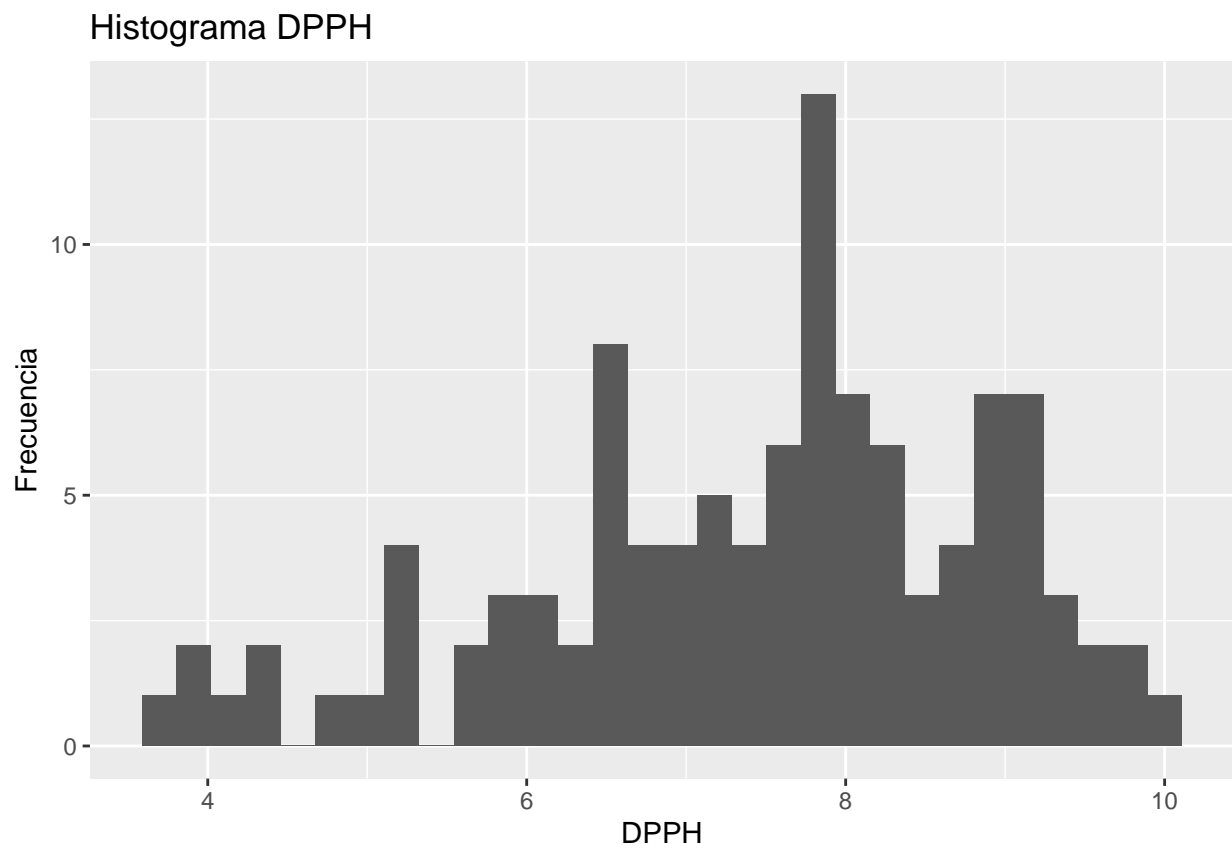
```
ggplot(Datos_Proyecto, aes(Car)) + geom_histogram()+ labs(title="Histograma Carotenos", x="Car", y="Frecuencia")  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



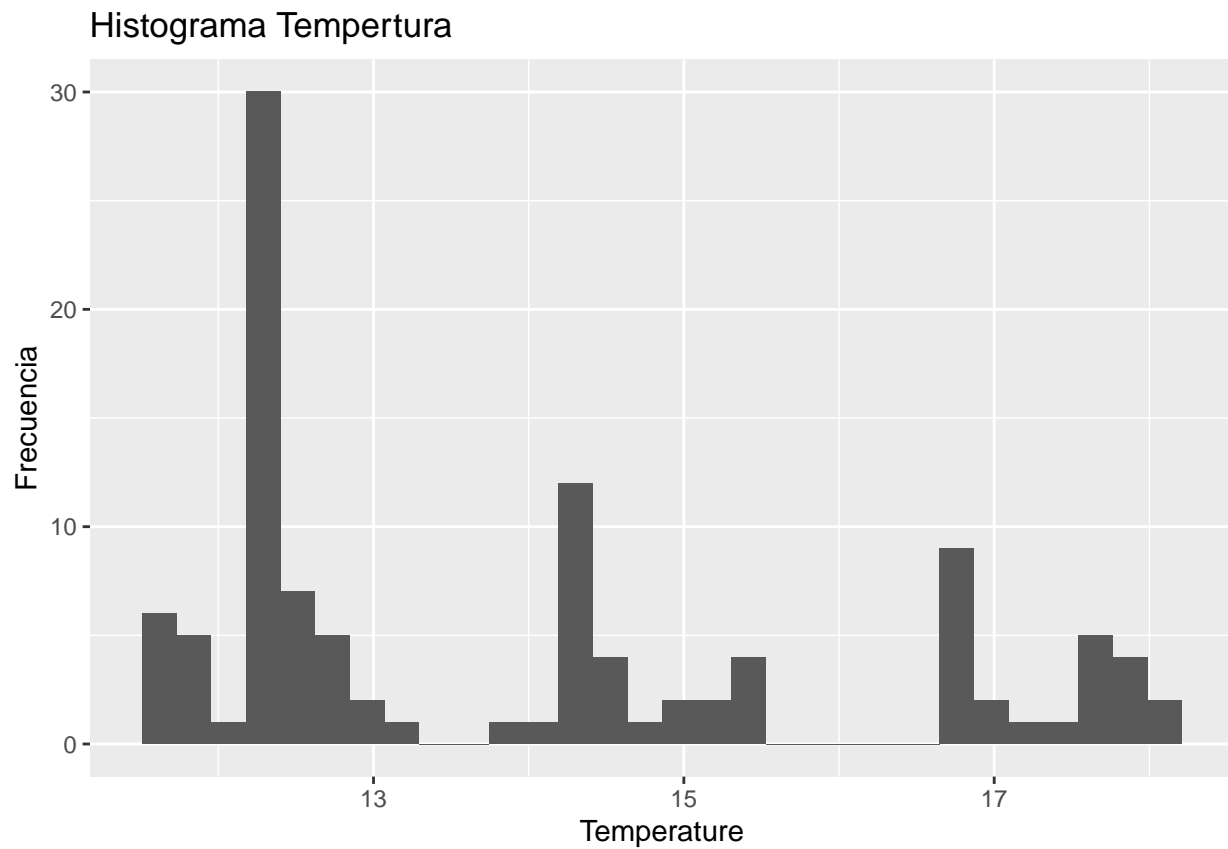
```
ggplot(Datos_Proyecto, aes(PC)) + geom_histogram()+ labs(title="Histograma Compuestos fenólicos", x="PC")  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



```
ggplot(Datos_Proyecto, aes(DPPH)) + geom_histogram()+ labs(title="Histograma DPPH", x="DPPH", y="Frecuencia")  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

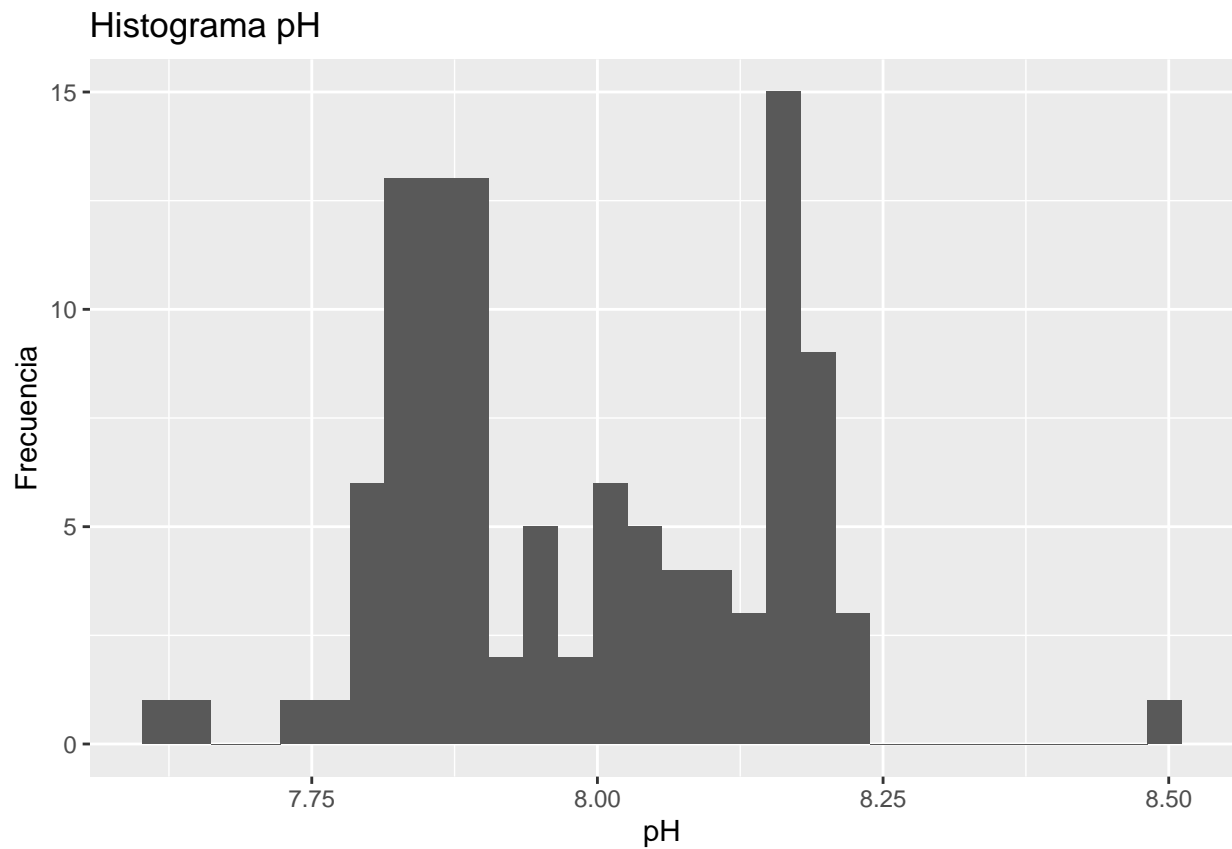


```
ggplot(Datos_Proyecto, aes(Temperature)) + geom_histogram()+ labs(title="Histograma Tempertura", x="Temperatura")  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

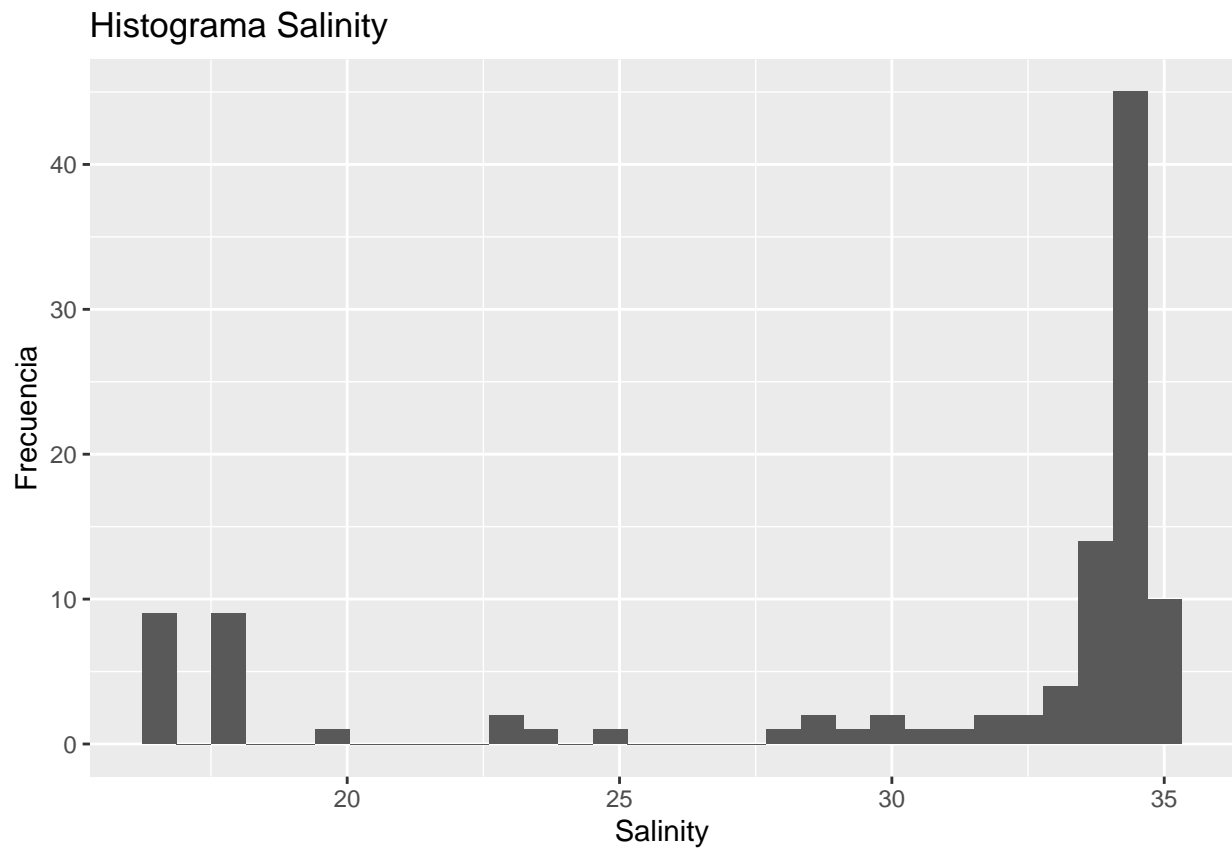


```
ggplot(Datos_Proyecto, aes(pH)) + geom_histogram()+ labs(title="Histograma pH", x="pH", y="Frecuencia")  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



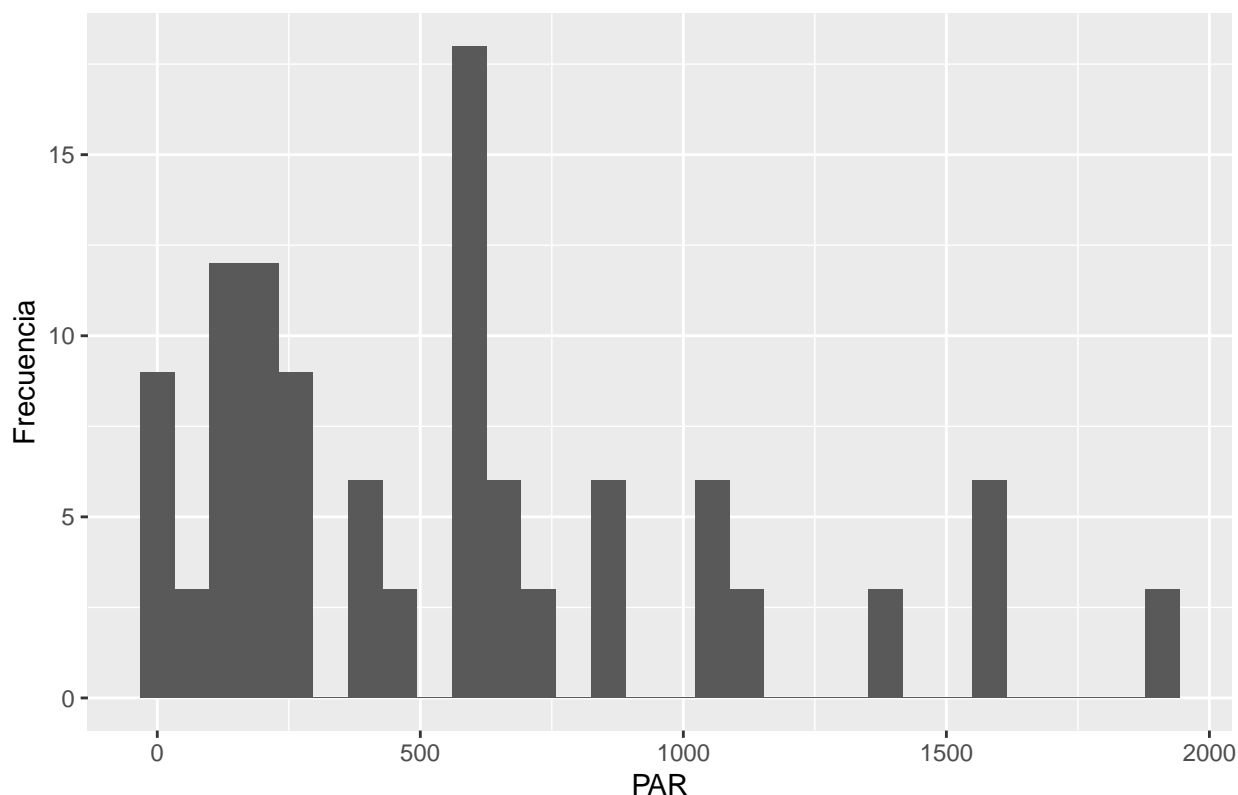


```
ggplot(Datos_Proyecto, aes(Salinity)) + geom_histogram()+ labs(title="Histograma Salinity", x="Salinity", y="Frecuencia")  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



```
ggplot(Datos_Proyecto, aes(PAR)) + geom_histogram()+ labs(title="Histograma Radiación fotosintéticamnet")
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

## Histograma Radiación fotosintéticamnete activa



## 4. Datos balanceados y tablas de frecuencia

```
str(Datos_Proyecto)
```

```
## tibble [108 x 12] (S3: tbl_df/tbl/data.frame)
## $ Seasons      : Factor w/ 4 levels "Autumn","Spring",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ time         : Factor w/ 3 levels "day 1","day 2",...: 1 1 1 1 1 1 1 1 1 2 ...
## $ Replicate    : Factor w/ 9 levels "R1","R2","R3",...: 1 2 3 4 5 6 7 8 9 1 ...
## $ Chla         : num [1:108] 1.04 1.6 1.52 1.48 1.14 ...
## $ Chlc         : num [1:108] 0.095 0.155 0.143 0.152 0.108 0.115 0.148 0.105 0.102 0.134 ...
## $ Car          : num [1:108] 0.605 0.954 0.931 0.905 0.694 0.752 0.884 0.659 0.62 0.937 ...
## $ PC          : num [1:108] 9.12 13.87 15.83 19.89 19.81 ...
## $ DPPH         : num [1:108] 7.58 6.08 7.81 7.02 7.2 ...
## $ Temperature : num [1:108] 12.3 12.3 12.3 12.3 12.3 ...
## $ pH           : num [1:108] 7.84 7.84 7.84 7.85 7.85 7.85 7.88 7.88 7.88 7.84 ...
## $ Salinity     : num [1:108] 33.7 33.7 33.7 17.9 17.9 ...
## $ PAR          : num [1:108] 594 594 594 1563 1563 ...
```

```
Datos_Proyecto$Seasons <- as.factor(Datos_Proyecto$Seasons)
Datos_Proyecto$time <- as.factor(Datos_Proyecto$time)
Datos_Proyecto$Replicate <- as.factor(Datos_Proyecto$Replicate)
summary(Datos_Proyecto)
```

```
##      Seasons      time      Replicate      Chla      Chlc
## Autumn:27 day 1:36 R1      :12      Min.    :0.6730      Min.    :0.01000
## Spring:27 day 2:36 R2      :12      1st Qu.:0.9888      1st Qu.:0.06775
## Summer:27 day 3:36 R3      :12      Median :1.1660      Median :0.09500
```

```
## Winter:27          R4      :12   Mean   :1.1856   Mean    :0.09365
##                   R5      :12   3rd Qu.:1.3813   3rd Qu.:0.10975
##                   R6      :12   Max.    :1.9690   Max.     :0.22100
##                   (Other):36
##           Car           PC           DPPH           Temperature
## Min.    :0.4190   Min.    : 4.600   Min.    : 3.792   Min.    :11.54
## 1st Qu.:0.6240   1st Qu.: 9.953   1st Qu.: 6.539   1st Qu.:12.29
## Median :0.7520   Median :13.815   Median : 7.769   Median :12.88
## Mean    :0.7557   Mean    :15.153   Mean    : 7.444   Mean    :13.98
## 3rd Qu.:0.8780   3rd Qu.:18.990   3rd Qu.: 8.433   3rd Qu.:15.35
## Max.    :1.2080   Max.    :37.340   Max.    :10.097   Max.    :18.02
##
##           pH           Salinity           PAR
## Min.    :7.620   Min.    :16.44   Min.    : 9.768
## 1st Qu.:7.850   1st Qu.:29.62   1st Qu.:196.000
## Median :7.960   Median :34.10   Median :525.793
## Mean    :7.982   Mean    :30.49   Mean    :569.983
## 3rd Qu.:8.150   3rd Qu.:34.63   3rd Qu.:764.500
## Max.    :8.500   Max.    :34.90   Max.    :1921.000
##
```

```
Datos_Proyecto$Chla
```

```
## [1] 1.040 1.597 1.521 1.479 1.139 1.166 1.380 1.173 1.084 1.491 1.182 1.256
## [13] 1.699 1.210 1.547 1.635 0.953 1.677 0.769 0.967 1.166 1.531 1.222 1.385
## [25] 1.005 1.000 1.176 0.808 0.869 0.883 0.954 0.882 0.826 0.816 0.870 0.929
## [37] 0.786 0.835 0.855 1.034 1.058 1.245 0.903 0.919 1.006 0.996 0.815 1.108
## [49] 1.021 1.013 0.808 0.745 1.038 0.825 1.616 1.319 1.036 1.184 0.913 1.298
## [61] 1.021 1.065 1.118 1.058 1.289 1.063 1.591 1.202 1.526 1.191 1.188 1.140
## [73] 1.136 1.969 1.611 1.319 1.074 1.414 1.635 1.278 1.839 1.192 1.137 0.936
## [85] 0.673 1.329 1.555 1.199 1.210 1.009 1.127 1.190 0.864 0.943 1.432 1.322
## [97] 1.345 1.210 1.400 1.501 1.513 1.310 1.547 1.578 1.558 1.707 0.832 1.040
```

```
tableChla <-as.data.frame(table(Chla = Datos_Proyecto$Chla))
tableChla
```

```
##      Chla Freq
## 1  0.673     1
## 2  0.745     1
## 3  0.769     1
## 4  0.786     1
## 5  0.808     2
## 6  0.815     1
## 7  0.816     1
## 8  0.825     1
## 9  0.826     1
## 10 0.832     1
## 11 0.835     1
## 12 0.855     1
## 13 0.864     1
## 14 0.869     1
## 15 0.87     1
## 16 0.882     1
## 17 0.883     1
## 18 0.903     1
## 19 0.913     1
```

##	20	0.919	1
##	21	0.929	1
##	22	0.936	1
##	23	0.943	1
##	24	0.953	1
##	25	0.954	1
##	26	0.967	1
##	27	0.996	1
##	28	1	1
##	29	1.005	1
##	30	1.006	1
##	31	1.009	1
##	32	1.013	1
##	33	1.021	2
##	34	1.034	1
##	35	1.036	1
##	36	1.038	1
##	37	1.04	2
##	38	1.058	2
##	39	1.063	1
##	40	1.065	1
##	41	1.074	1
##	42	1.084	1
##	43	1.108	1
##	44	1.118	1
##	45	1.127	1
##	46	1.136	1
##	47	1.137	1
##	48	1.139	1
##	49	1.14	1
##	50	1.166	2
##	51	1.173	1
##	52	1.176	1
##	53	1.182	1
##	54	1.184	1
##	55	1.188	1
##	56	1.19	1
##	57	1.191	1
##	58	1.192	1
##	59	1.199	1
##	60	1.202	1
##	61	1.21	3
##	62	1.222	1
##	63	1.245	1
##	64	1.256	1
##	65	1.278	1
##	66	1.289	1
##	67	1.298	1
##	68	1.31	1
##	69	1.319	2
##	70	1.322	1
##	71	1.329	1
##	72	1.345	1
##	73	1.38	1

```
## 74 1.385 1
## 75 1.4 1
## 76 1.414 1
## 77 1.432 1
## 78 1.479 1
## 79 1.491 1
## 80 1.501 1
## 81 1.513 1
## 82 1.521 1
## 83 1.526 1
## 84 1.531 1
## 85 1.547 2
## 86 1.555 1
## 87 1.558 1
## 88 1.578 1
## 89 1.591 1
## 90 1.597 1
## 91 1.611 1
## 92 1.616 1
## 93 1.635 2
## 94 1.677 1
## 95 1.699 1
## 96 1.707 1
## 97 1.839 1
## 98 1.969 1
```

```
Datos_Proyecto$Chlc
```

```
## [1] 0.095 0.155 0.143 0.152 0.108 0.115 0.148 0.105 0.102 0.134 0.102 0.117
## [13] 0.154 0.107 0.158 0.101 0.097 0.166 0.074 0.082 0.100 0.132 0.098 0.129
## [25] 0.090 0.092 0.112 0.119 0.045 0.102 0.046 0.090 0.130 0.107 0.097 0.088
## [37] 0.055 0.109 0.010 0.178 0.047 0.029 0.057 0.088 0.081 0.108 0.157 0.086
## [49] 0.221 0.106 0.034 0.041 0.049 0.033 0.102 0.084 0.067 0.076 0.049 0.081
## [61] 0.064 0.064 0.062 0.061 0.084 0.069 0.094 0.080 0.095 0.055 0.055 0.051
## [73] 0.079 0.129 0.103 0.084 0.057 0.097 0.101 0.058 0.107 0.062 0.065 0.042
## [85] 0.027 0.068 0.095 0.088 0.087 0.080 0.082 0.086 0.075 0.132 0.119 0.107
## [97] 0.101 0.096 0.102 0.118 0.113 0.101 0.135 0.141 0.131 0.127 0.060 0.085
```

```
tableChlc <-as.data.frame(table(Chlc = Datos_Proyecto$Chlc))
tableChlc
```

```
##      Chlc Freq
## 1  0.01      1
## 2  0.027      1
## 3  0.029      1
## 4  0.033      1
## 5  0.034      1
## 6  0.041      1
## 7  0.042      1
## 8  0.045      1
## 9  0.046      1
## 10 0.047      1
## 11 0.049      2
## 12 0.051      1
## 13 0.055      3
## 14 0.057      2
```

## 15	0.058	1
## 16	0.06	1
## 17	0.061	1
## 18	0.062	2
## 19	0.064	2
## 20	0.065	1
## 21	0.067	1
## 22	0.068	1
## 23	0.069	1
## 24	0.074	1
## 25	0.075	1
## 26	0.076	1
## 27	0.079	1
## 28	0.08	2
## 29	0.081	2
## 30	0.082	2
## 31	0.084	3
## 32	0.085	1
## 33	0.086	2
## 34	0.087	1
## 35	0.088	3
## 36	0.09	2
## 37	0.092	1
## 38	0.094	1
## 39	0.095	3
## 40	0.096	1
## 41	0.097	3
## 42	0.098	1
## 43	0.1	1
## 44	0.101	4
## 45	0.102	5
## 46	0.103	1
## 47	0.105	1
## 48	0.106	1
## 49	0.107	4
## 50	0.108	2
## 51	0.109	1
## 52	0.112	1
## 53	0.113	1
## 54	0.115	1
## 55	0.117	1
## 56	0.118	1
## 57	0.119	2
## 58	0.127	1
## 59	0.129	2
## 60	0.13	1
## 61	0.131	1
## 62	0.132	2
## 63	0.134	1
## 64	0.135	1
## 65	0.141	1
## 66	0.143	1
## 67	0.148	1
## 68	0.152	1

```
## 69 0.154 1
## 70 0.155 1
## 71 0.157 1
## 72 0.158 1
## 73 0.166 1
## 74 0.178 1
## 75 0.221 1
```

```
Datos_Proyecto$Car
```

```
## [1] 0.605 0.954 0.931 0.905 0.694 0.752 0.884 0.659 0.620 0.937 0.797 0.765
## [13] 1.026 0.746 0.866 1.031 0.626 1.067 0.511 0.695 0.743 0.910 0.733 0.828
## [25] 0.624 0.632 0.782 0.617 0.703 0.453 0.641 0.452 0.558 0.419 0.443 0.460
## [37] 0.669 0.438 0.503 0.635 0.621 0.752 0.813 0.547 0.824 0.584 0.469 0.673
## [49] 0.609 0.568 0.660 0.461 0.590 0.435 0.988 0.797 0.624 0.804 0.643 0.865
## [61] 0.614 0.645 0.724 0.671 0.820 0.665 0.978 0.715 1.016 0.865 0.848 0.790
## [73] 0.631 1.161 0.990 0.824 0.695 0.957 1.056 0.835 1.208 0.767 0.755 0.623
## [85] 0.459 0.874 1.007 0.876 0.903 0.722 0.832 0.813 0.589 0.649 0.937 0.854
## [97] 0.906 0.787 0.921 0.860 0.897 0.760 0.962 1.007 1.044 1.172 0.586 0.707
```

```
tableCar <-as.data.frame(table(Car = Datos_Proyecto$Car))
```

```
tableCar
```

```
##      Car Freq
## 1  0.419    1
## 2  0.435    1
## 3  0.438    1
## 4  0.443    1
## 5  0.452    1
## 6  0.453    1
## 7  0.459    1
## 8   0.46    1
## 9  0.461    1
## 10 0.469    1
## 11 0.503    1
## 12 0.511    1
## 13 0.547    1
## 14 0.558    1
## 15 0.568    1
## 16 0.584    1
## 17 0.586    1
## 18 0.589    1
## 19  0.59    1
## 20 0.605    1
## 21 0.609    1
## 22 0.614    1
## 23 0.617    1
## 24  0.62    1
## 25 0.621    1
## 26 0.623    1
## 27 0.624    2
## 28 0.626    1
## 29 0.631    1
## 30 0.632    1
## 31 0.635    1
## 32 0.641    1
```



## 33	0.643	1
## 34	0.645	1
## 35	0.649	1
## 36	0.659	1
## 37	0.66	1
## 38	0.665	1
## 39	0.669	1
## 40	0.671	1
## 41	0.673	1
## 42	0.694	1
## 43	0.695	2
## 44	0.703	1
## 45	0.707	1
## 46	0.715	1
## 47	0.722	1
## 48	0.724	1
## 49	0.733	1
## 50	0.743	1
## 51	0.746	1
## 52	0.752	2
## 53	0.755	1
## 54	0.76	1
## 55	0.765	1
## 56	0.767	1
## 57	0.782	1
## 58	0.787	1
## 59	0.79	1
## 60	0.797	2
## 61	0.804	1
## 62	0.813	2
## 63	0.82	1
## 64	0.824	2
## 65	0.828	1
## 66	0.832	1
## 67	0.835	1
## 68	0.848	1
## 69	0.854	1
## 70	0.86	1
## 71	0.865	2
## 72	0.866	1
## 73	0.874	1
## 74	0.876	1
## 75	0.884	1
## 76	0.897	1
## 77	0.903	1
## 78	0.905	1
## 79	0.906	1
## 80	0.91	1
## 81	0.921	1
## 82	0.931	1
## 83	0.937	2
## 84	0.954	1
## 85	0.957	1
## 86	0.962	1

```
## 87 0.978 1
## 88 0.988 1
## 89 0.99 1
## 90 1.007 2
## 91 1.016 1
## 92 1.026 1
## 93 1.031 1
## 94 1.044 1
## 95 1.056 1
## 96 1.067 1
## 97 1.161 1
## 98 1.172 1
## 99 1.208 1
```

```
Datos_Proyecto$PC
```

```
## [1] 9.12 13.87 15.83 19.89 19.81 21.64 30.43 14.70 15.98 20.06 24.07 16.94
## [13] 18.67 21.74 16.66 19.53 26.15 16.97 9.63 9.70 10.04 13.76 11.84 11.30
## [25] 9.53 13.38 15.32 11.17 12.57 11.20 11.78 12.88 10.74 6.34 10.41 14.02
## [37] 6.62 9.97 7.35 13.14 17.24 14.00 15.51 14.16 15.73 16.33 13.34 12.10
## [49] 9.32 9.82 8.37 10.50 7.27 9.00 7.32 6.35 7.05 4.60 5.19 10.54
## [61] 9.90 9.75 12.52 11.50 19.73 7.55 10.54 9.48 11.27 16.76 16.95 14.44
## [73] 6.86 11.37 8.65 25.70 19.29 22.64 6.04 9.30 9.54 13.42 17.88 16.61
## [85] 13.62 13.93 16.60 34.56 28.47 26.34 28.63 28.26 22.67 18.89 17.17 21.74
## [97] 28.92 23.36 37.34 9.68 10.38 11.36 15.97 23.08 25.76 26.75 17.35 19.51
```

```
tablePC <-as.data.frame(table(PC = Datos_Proyecto$PC))
tablePC
```

```
##      PC Freq
## 1      4.6    1
## 2      5.19   1
## 3      6.04   1
## 4      6.34   1
## 5      6.35   1
## 6      6.62   1
## 7      6.86   1
## 8      7.05   1
## 9      7.27   1
## 10     7.32   1
## 11     7.35   1
## 12     7.55   1
## 13     8.37   1
## 14     8.65   1
## 15      9     1
## 16     9.12   1
## 17     9.3    1
## 18     9.32   1
## 19     9.48   1
## 20     9.53   1
## 21     9.54   1
## 22     9.63   1
## 23     9.68   1
## 24     9.7    1
## 25     9.75   1
## 26     9.82   1
```

## 27	9.9	1
## 28	9.97	1
## 29	10.04	1
## 30	10.38	1
## 31	10.41	1
## 32	10.5	1
## 33	10.54	2
## 34	10.74	1
## 35	11.17	1
## 36	11.2	1
## 37	11.27	1
## 38	11.3	1
## 39	11.36	1
## 40	11.37	1
## 41	11.5	1
## 42	11.78	1
## 43	11.84	1
## 44	12.1	1
## 45	12.52	1
## 46	12.57	1
## 47	12.88	1
## 48	13.14	1
## 49	13.34	1
## 50	13.38	1
## 51	13.42	1
## 52	13.62	1
## 53	13.76	1
## 54	13.87	1
## 55	13.93	1
## 56	14	1
## 57	14.02	1
## 58	14.16	1
## 59	14.44	1
## 60	14.7	1
## 61	15.32	1
## 62	15.51	1
## 63	15.73	1
## 64	15.83	1
## 65	15.97	1
## 66	15.98	1
## 67	16.33	1
## 68	16.6	1
## 69	16.61	1
## 70	16.66	1
## 71	16.76	1
## 72	16.94	1
## 73	16.95	1
## 74	16.97	1
## 75	17.17	1
## 76	17.24	1
## 77	17.35	1
## 78	17.88	1
## 79	18.67	1
## 80	18.89	1

```
## 81 19.29 1
## 82 19.51 1
## 83 19.53 1
## 84 19.73 1
## 85 19.81 1
## 86 19.89 1
## 87 20.06 1
## 88 21.64 1
## 89 21.74 2
## 90 22.64 1
## 91 22.67 1
## 92 23.08 1
## 93 23.36 1
## 94 24.07 1
## 95 25.7 1
## 96 25.76 1
## 97 26.15 1
## 98 26.34 1
## 99 26.75 1
## 100 28.26 1
## 101 28.47 1
## 102 28.63 1
## 103 28.92 1
## 104 30.43 1
## 105 34.56 1
## 106 37.34 1
```

```
Datos_Proyecto$DPPH
```

```
## [1] 7.577619 6.084712 7.812297 7.015315 7.201112 5.119478 6.236736
## [8] 6.470628 6.376712 4.073155 7.845322 7.583337 7.908261 8.899032
## [15] 6.813768 5.190382 8.967073 6.553575 7.879030 8.096631 8.696681
## [22] 7.791584 6.538016 5.285725 8.259253 9.106009 8.657348 6.528569
## [29] 7.284957 6.951946 7.674882 7.923461 7.962869 6.470648 7.388045
## [36] 7.325970 5.551967 5.901315 5.965841 8.367213 8.201024 8.399609
## [43] 7.418215 7.926512 7.178267 6.595440 4.375118 8.674017 8.066500
## [50] 8.925602 9.084461 6.153443 8.345454 7.795784 5.701777 5.262799
## [57] 3.948226 3.833870 3.792109 4.963813 7.114410 7.086409 7.745987
## [64] 6.765577 6.888801 6.467177 6.818926 9.133867 7.647086 8.882152
## [71] 8.080329 8.143273 4.343945 7.838153 5.807068 7.130447 8.804655
## [78] 9.812655 6.119257 7.580932 4.730263 9.864639 9.616306 10.096986
## [85] 9.066688 9.130485 8.372641 8.533433 9.463085 6.538878 7.844437
## [92] 7.882420 8.984493 6.900315 7.812050 7.537598 8.095900 9.076124
## [99] 6.758803 9.079230 9.332209 8.340027 9.282829 9.304817 8.981271
## [106] 8.906240 8.156935 8.045335
```

```
tableDPPH <-as.data.frame(table(DPPH = Datos_Proyecto$DPPH))
tableDPPH
```

```
##          DPPH Freq
## 1 3.7921091487048 1
## 2 3.83386983732118 1
## 3 3.94822628290414 1
## 4 4.07315491016667 1
## 5 4.34394543819923 1
## 6 4.37511757369667 1
```

## 7	4.73026296031757	1
## 8	4.96381302541734	1
## 9	5.1194784378545	1
## 10	5.19038236694484	1
## 11	5.26279857279554	1
## 12	5.28572544493435	1
## 13	5.55196731924744	1
## 14	5.70177684116028	1
## 15	5.8070681644718	1
## 16	5.90131463394357	1
## 17	5.96584130019852	1
## 18	6.08471171781293	1
## 19	6.11925664673893	1
## 20	6.15344293599768	1
## 21	6.23673572752751	1
## 22	6.37671184950451	1
## 23	6.4671773936417	1
## 24	6.47062777818111	1
## 25	6.47064767825994	1
## 26	6.52856916357015	1
## 27	6.53801630112277	1
## 28	6.53887774696075	1
## 29	6.55357474292809	1
## 30	6.59544000293789	1
## 31	6.75880275621157	1
## 32	6.76557744492377	1
## 33	6.81376807198535	1
## 34	6.81892550440379	1
## 35	6.88880073443357	1
## 36	6.90031501583034	1
## 37	6.95194609308745	1
## 38	7.01531486776157	1
## 39	7.08640909495452	1
## 40	7.11441001985266	1
## 41	7.13044683746743	1
## 42	7.17826668387887	1
## 43	7.20111198374913	1
## 44	7.28495721947921	1
## 45	7.32596996180665	1
## 46	7.3880453432457	1
## 47	7.41821472683629	1
## 48	7.53759848818543	1
## 49	7.57761861614438	1
## 50	7.58093204253681	1
## 51	7.58333744979186	1
## 52	7.64708630985723	1
## 53	7.67488209576931	1
## 54	7.74598658508453	1
## 55	7.79158426429331	1
## 56	7.79578363292874	1
## 57	7.81205032442958	1
## 58	7.81229693476463	1
## 59	7.83815304355675	1
## 60	7.8444370360342	1

```

## 61 7.84532151099326 1
## 62 7.87903013092856 1
## 63 7.88242034424958 1
## 64 7.90826123438925 1
## 65 7.92346109756698 1
## 66 7.92651169747938 1
## 67 7.96286949555254 1
## 68 8.0453346445548 1
## 69 8.06649986730547 1
## 70 8.0803288577418 1
## 71 8.09590000250503 1
## 72 8.09663070958325 1
## 73 8.14327334588672 1
## 74 8.15693463388017 1
## 75 8.20102375293735 1
## 76 8.25925298394825 1
## 77 8.34002719005116 1
## 78 8.34545377528216 1
## 79 8.36721344084489 1
## 80 8.37264084101011 1
## 81 8.39960941129238 1
## 82 8.53343299621107 1
## 83 8.65734800174523 1
## 84 8.67401723119002 1
## 85 8.69668123896576 1
## 86 8.80465504054987 1
## 87 8.88215196259132 1
## 88 8.89903180720949 1
## 89 8.90623955108464 1
## 90 8.92560217841661 1
## 91 8.96707301649087 1
## 92 8.98127144216437 1
## 93 8.98449281324139 1
## 94 9.06668762571664 1
## 95 9.07612448459151 1
## 96 9.0792302344551 1
## 97 9.08446116671832 1
## 98 9.10600868735363 1
## 99 9.13048519777377 1
## 100 9.13386697153185 1
## 101 9.28282925475416 1
## 102 9.30481657147222 1
## 103 9.3322087818022 1
## 104 9.4630849489861 1
## 105 9.61630593483038 1
## 106 9.81265544853422 1
## 107 9.86463936386016 1
## 108 10.0969856269446 1

```

Datos\_Proyecto\$Temperature

```

## [1] 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29
## [13] 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29 12.29
## [25] 12.29 12.29 12.29 11.54 11.55 11.57 12.29 12.60 12.23 11.96 11.92 11.92
## [37] 11.68 11.67 11.71 12.47 12.46 12.27 12.73 12.76 12.73 11.87 11.81 11.88

```

```
## [49] 12.72 12.66 12.61 12.58 12.43 12.45 13.01 13.12 13.05 14.31 14.57 14.54
## [61] 14.43 14.38 14.33 13.80 14.03 14.49 15.18 15.34 15.37 15.45 15.25 15.49
## [73] 14.94 14.82 14.94 17.21 17.01 16.95 17.70 17.49 17.72 14.33 14.32 14.33
## [85] 16.77 16.73 16.83 17.80 17.84 17.84 14.23 14.23 14.22 16.76 16.73 16.74
## [97] 17.71 17.99 18.02 14.28 14.27 14.28 16.81 16.81 16.79 17.76 17.80 17.73
```

```
tableTemp <-as.data.frame(table(Temperature = Datos_Proyecto$Temperature))
tableTemp
```

```
##      Temperature Freq
## 1          11.54     1
## 2          11.55     1
## 3          11.57     1
## 4          11.67     1
## 5          11.68     1
## 6          11.71     1
## 7          11.81     1
## 8          11.87     1
## 9          11.88     1
## 10         11.92     2
## 11         11.96     1
## 12         12.23     1
## 13         12.27     1
## 14         12.29    28
## 15         12.43     1
## 16         12.45     1
## 17         12.46     1
## 18         12.47     1
## 19         12.58     1
## 20          12.6     1
## 21         12.61     1
## 22         12.66     1
## 23         12.72     1
## 24         12.73     2
## 25         12.76     1
## 26         13.01     1
## 27         13.05     1
## 28         13.12     1
## 29         13.8     1
## 30         14.03     1
## 31         14.22     1
## 32         14.23     2
## 33         14.27     1
## 34         14.28     2
## 35         14.31     1
## 36         14.32     1
## 37         14.33     3
## 38         14.38     1
## 39         14.43     1
## 40         14.49     1
## 41         14.54     1
## 42         14.57     1
## 43         14.82     1
## 44         14.94     2
## 45         15.18     1
```

```
## 46      15.25      1
## 47      15.34      1
## 48      15.37      1
## 49      15.45      1
## 50      15.49      1
## 51      16.73      2
## 52      16.74      1
## 53      16.76      1
## 54      16.77      1
## 55      16.79      1
## 56      16.81      2
## 57      16.83      1
## 58      16.95      1
## 59      17.01      1
## 60      17.21      1
## 61      17.49      1
## 62       17.7      1
## 63      17.71      1
## 64      17.72      1
## 65      17.73      1
## 66      17.76      1
## 67       17.8      2
## 68      17.84      2
## 69      17.99      1
## 70      18.02      1
```

```
Datos_Proyecto$pH
```

```
## [1] 7.84 7.84 7.84 7.85 7.85 7.85 7.88 7.88 7.88 7.84 7.84 7.84 7.85 7.85 7.85
## [16] 7.88 7.88 7.88 7.84 7.84 7.84 7.85 7.85 7.85 7.88 7.88 7.88 7.80 7.87 7.88
## [31] 7.96 7.94 7.94 8.12 8.01 7.97 7.89 7.92 7.93 8.03 8.03 8.01 8.01 8.00 8.00
## [46] 7.87 7.85 7.87 7.96 7.97 7.96 8.07 8.03 8.02 7.74 7.89 7.90 8.09 8.10 8.10
## [61] 8.23 8.23 8.23 7.77 7.62 7.66 8.50 8.05 8.04 8.12 8.10 8.12 8.06 8.08 8.07
## [76] 8.15 8.15 8.15 8.17 8.17 8.15 7.80 7.81 7.81 8.16 8.17 8.16 8.18 8.18 8.18
## [91] 7.81 7.81 7.82 8.16 8.16 8.16 8.18 8.18 8.18 7.82 7.82 7.82 8.16 8.16 8.16
## [106] 8.18 8.18 8.18
```

```
tablepH <-as.data.frame(table(pH = Datos_Proyecto$pH))
tablepH
```

```
##      pH Freq
## 1  7.62     1
## 2  7.66     1
## 3  7.74     1
## 4  7.77     1
## 5   7.8     2
## 6  7.81     4
## 7  7.82     4
## 8  7.84     9
## 9  7.85    10
## 10 7.87     3
## 11 7.88    10
## 12 7.89     2
## 13 7.9     1
## 14 7.92     1
```



```
## 15 7.93 1
## 16 7.94 2
## 17 7.96 3
## 18 7.97 2
## 19 8 2
## 20 8.01 3
## 21 8.02 1
## 22 8.03 3
## 23 8.04 1
## 24 8.05 1
## 25 8.06 1
## 26 8.07 2
## 27 8.08 1
## 28 8.09 1
## 29 8.1 3
## 30 8.12 3
## 31 8.15 4
## 32 8.16 8
## 33 8.17 3
## 34 8.18 9
## 35 8.23 3
## 36 8.5 1
```

```
Datos_Proyecto$Salinity
```

```
## [1] 33.74000 33.74000 33.74000 17.87000 17.87000 17.87000 16.44000 16.44000
## [9] 16.44000 33.74000 33.74000 33.74000 17.87000 17.87000 17.87000 16.44000
## [17] 16.44000 16.44000 33.74000 33.74000 33.74000 17.87000 17.87000 17.87000
## [25] 16.44000 16.44000 16.44000 33.63000 28.76000 30.61000 31.02000 34.38000
## [33] 29.75000 32.57000 20.05000 33.56000 33.11000 22.72000 24.55000 33.09000
## [41] 31.89000 31.95000 32.22000 23.33000 33.84000 29.87000 33.59000 22.73000
## [49] 27.88000 33.31000 34.27000 29.23000 34.33000 32.92000 33.74000 34.58000
## [57] 34.10000 28.90000 34.45000 34.29000 34.57000 34.74000 34.62000 34.90000
## [65] 34.60000 34.50000 34.10000 34.42000 34.54000 34.73000 34.60000 34.63000
## [73] 34.52000 34.67000 34.67000 34.54000 34.63000 34.66000 34.57000 34.75000
## [81] 34.66000 34.74265 34.68162 34.69101 34.54237 34.64999 34.52648 34.71626
## [89] 34.64201 34.74114 34.10688 34.66292 34.63660 34.60394 34.65577 34.67205
## [97] 34.71561 34.72834 34.72259 34.64873 34.68386 34.66909 34.48028 34.48028
## [105] 34.55885 34.40823 34.30854 34.69048
```

```
tableSalinity <-as.data.frame(table(Salinity = Datos_Proyecto$Salinity))
tableSalinity
```

```
##      Salinity Freq
## 1      16.44     9
## 2      17.87     9
## 3      20.05     1
## 4      22.72     1
## 5      22.73     1
## 6      23.33     1
## 7      24.55     1
## 8      27.88     1
## 9      28.76     1
## 10     28.9      1
## 11     29.23     1
```

## 12	29.75	1
## 13	29.87	1
## 14	30.61	1
## 15	31.02	1
## 16	31.89	1
## 17	31.95	1
## 18	32.22	1
## 19	32.57	1
## 20	32.92	1
## 21	33.09	1
## 22	33.11	1
## 23	33.31	1
## 24	33.56	1
## 25	33.59	1
## 26	33.63	1
## 27	33.74	10
## 28	33.84	1
## 29	34.1	2
## 30	34.106876373291	1
## 31	34.27	1
## 32	34.29	1
## 33	34.3085403442383	1
## 34	34.33	1
## 35	34.38	1
## 36	34.4082298278809	1
## 37	34.42	1
## 38	34.45	1
## 39	34.4802780151367	2
## 40	34.5	1
## 41	34.52	1
## 42	34.526481628418	1
## 43	34.54	2
## 44	34.542366027832	1
## 45	34.5588531494141	1
## 46	34.57	2
## 47	34.58	1
## 48	34.6	2
## 49	34.6039352416992	1
## 50	34.62	1
## 51	34.63	2
## 52	34.6365966796875	1
## 53	34.6420097351074	1
## 54	34.6487312316895	1
## 55	34.6499938964844	1
## 56	34.6557655334473	1
## 57	34.66	2
## 58	34.6629180908203	1
## 59	34.6690940856934	1
## 60	34.67	2
## 61	34.6720542907715	1
## 62	34.6816215515137	1
## 63	34.6838569641113	1
## 64	34.6904830932617	1
## 65	34.6910133361816	1

```
## 66 34.7156066894531 1
## 67 34.7162590026855 1
## 68 34.7225875854492 1
## 69 34.7283363342285 1
## 70 34.73 1
## 71 34.74 1
## 72 34.7411422729492 1
## 73 34.7426490783691 1
## 74 34.75 1
## 75 34.9 1
```

```
Datos_Proyecto$PAR
```

```
## [1] 593.98700 593.98700 593.98700 1562.99667 1562.99667 1562.99667
## [7] 210.44448 210.44448 210.44448 462.75900 462.75900 462.75900
## [13] 1562.96000 1562.96000 1562.96000 408.04300 408.04300 408.04300
## [19] 75.39680 75.39680 75.39680 743.66600 743.66600 743.66600
## [25] 118.59000 118.59000 118.59000 603.63200 603.63200 603.63200
## [31] 1054.56000 1054.56000 1054.56000 9.76801 9.76801 9.76801
## [37] 588.82800 588.82800 588.82800 1067.00000 1067.00000 1067.00000
## [43] 10.37850 10.37850 10.37850 242.21600 242.21600 242.21600
## [49] 842.72000 842.72000 842.72000 12.43890 12.43890 12.43890
## [55] 198.00000 198.00000 198.00000 1118.00000 1118.00000 1118.00000
## [61] 624.00000 624.00000 624.00000 126.00000 126.00000 126.00000
## [67] 827.00000 827.00000 827.00000 605.00000 605.00000 605.00000
## [73] 134.00000 134.00000 134.00000 1921.00000 1921.00000 1921.00000
## [79] 648.00000 648.00000 648.00000 292.00000 292.00000 292.00000
## [85] 1411.00000 1411.00000 1411.00000 368.00000 368.00000 368.00000
## [91] 121.00000 121.00000 121.00000 658.00000 658.00000 658.00000
## [97] 287.00000 287.00000 287.00000 201.00000 201.00000 201.00000
## [103] 620.00000 620.00000 620.00000 190.00000 190.00000 190.00000
```

```
tablePAR <-as.data.frame(table(PAR = Datos_Proyecto$PAR))
tablePAR
```

```
## PAR Freq
## 1 9.76801 3
## 2 10.3785 3
## 3 12.4389 3
## 4 75.3968 3
## 5 118.59 3
## 6 121 3
## 7 126 3
## 8 134 3
## 9 190 3
## 10 198 3
## 11 201 3
## 12 210.444483333333 3
## 13 242.216 3
## 14 287 3
## 15 292 3
## 16 368 3
## 17 408.043 3
## 18 462.759 3
## 19 588.828 3
## 20 593.987 3
```

```
## 21      603.632    3
## 22      605      3
## 23      620      3
## 24      624      3
## 25      648      3
## 26      658      3
## 27     743.666    3
## 28      827      3
## 29     842.72     3
## 30    1054.56     3
## 31     1067      3
## 32     1118      3
## 33     1411      3
## 34    1562.96     3
## 35 1562.99666666667 3
## 36     1921      3
```

## 5. Relación entre variables cuantitativas y factores

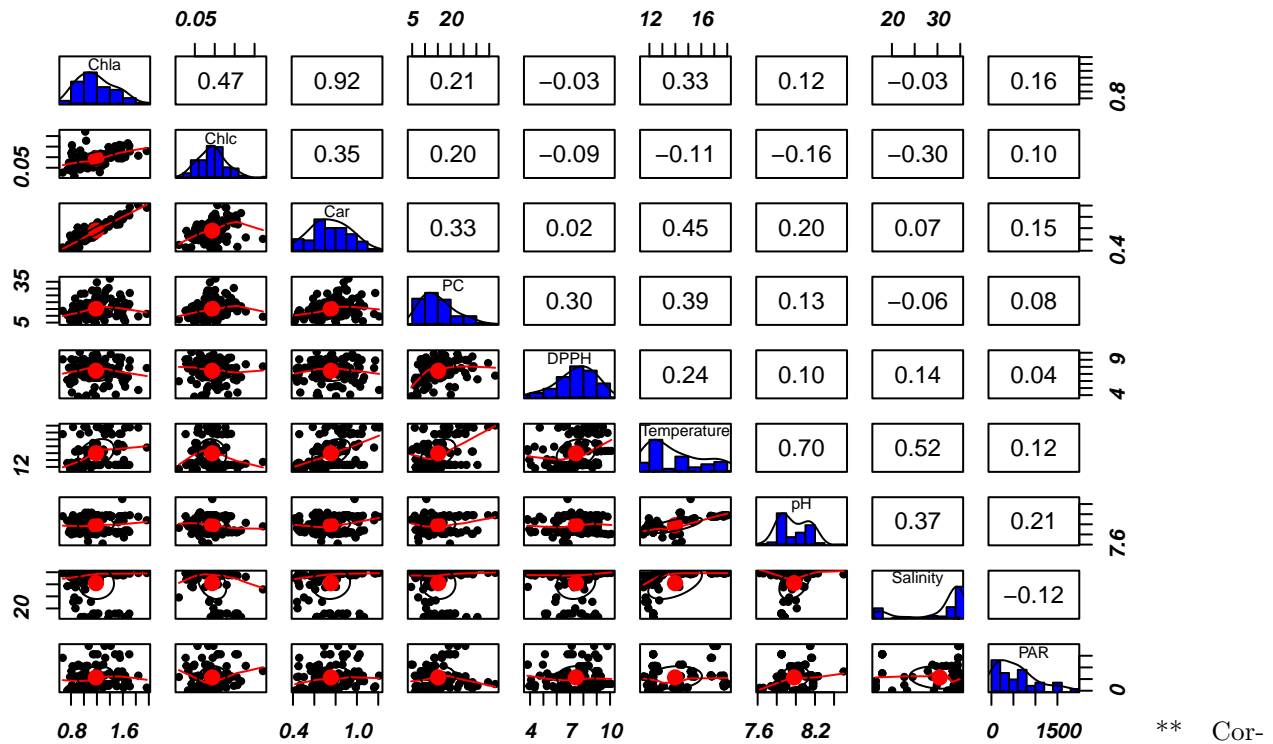
\*\* No se incluirán las variables Seasons, time, y Replicate porque son variables categóricas.

```
summary(Datos_Proyecto)
```

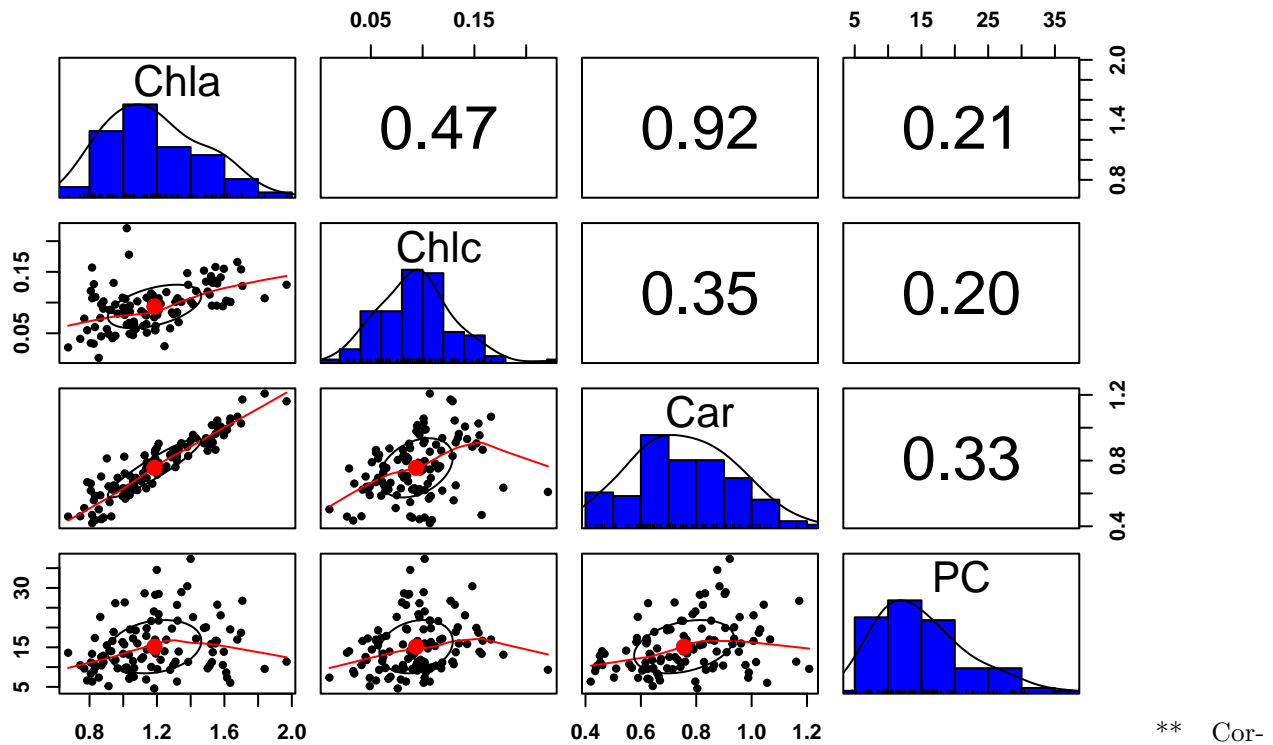
```
##      Seasons      time      Replicate      Chla      Chlc
## Autumn:27 day 1:36 R1      :12 Min.      :0.6730 Min.      :0.01000
## Spring:27 day 2:36 R2      :12 1st Qu.:0.9888 1st Qu.:0.06775
## Summer:27 day 3:36 R3      :12 Median   :1.1660 Median   :0.09500
## Winter:27      R4      :12 Mean      :1.1856 Mean      :0.09365
##      R5      :12 3rd Qu.:1.3813 3rd Qu.:0.10975
##      R6      :12 Max.      :1.9690 Max.      :0.22100
##      (Other):36
##      Car      PC      DPPH      Temperature
## Min.      :0.4190 Min.      : 4.600 Min.      : 3.792 Min.      :11.54
## 1st Qu.:0.6240 1st Qu.: 9.953 1st Qu.: 6.539 1st Qu.:12.29
## Median :0.7520 Median :13.815 Median : 7.769 Median :12.88
## Mean      :0.7557 Mean      :15.153 Mean      : 7.444 Mean      :13.98
## 3rd Qu.:0.8780 3rd Qu.:18.990 3rd Qu.: 8.433 3rd Qu.:15.35
## Max.      :1.2080 Max.      :37.340 Max.      :10.097 Max.      :18.02
##
##      pH      Salinity      PAR
## Min.      :7.620 Min.      :16.44 Min.      : 9.768
## 1st Qu.:7.850 1st Qu.:29.62 1st Qu.:196.000
## Median :7.960 Median :34.10 Median :525.793
## Mean      :7.982 Mean      :30.49 Mean      :569.983
## 3rd Qu.:8.150 3rd Qu.:34.63 3rd Qu.:764.500
## Max.      :8.500 Max.      :34.90 Max.      :1921.000
##
```

## 5. Graficas de correlación de variables continuas (pearson)

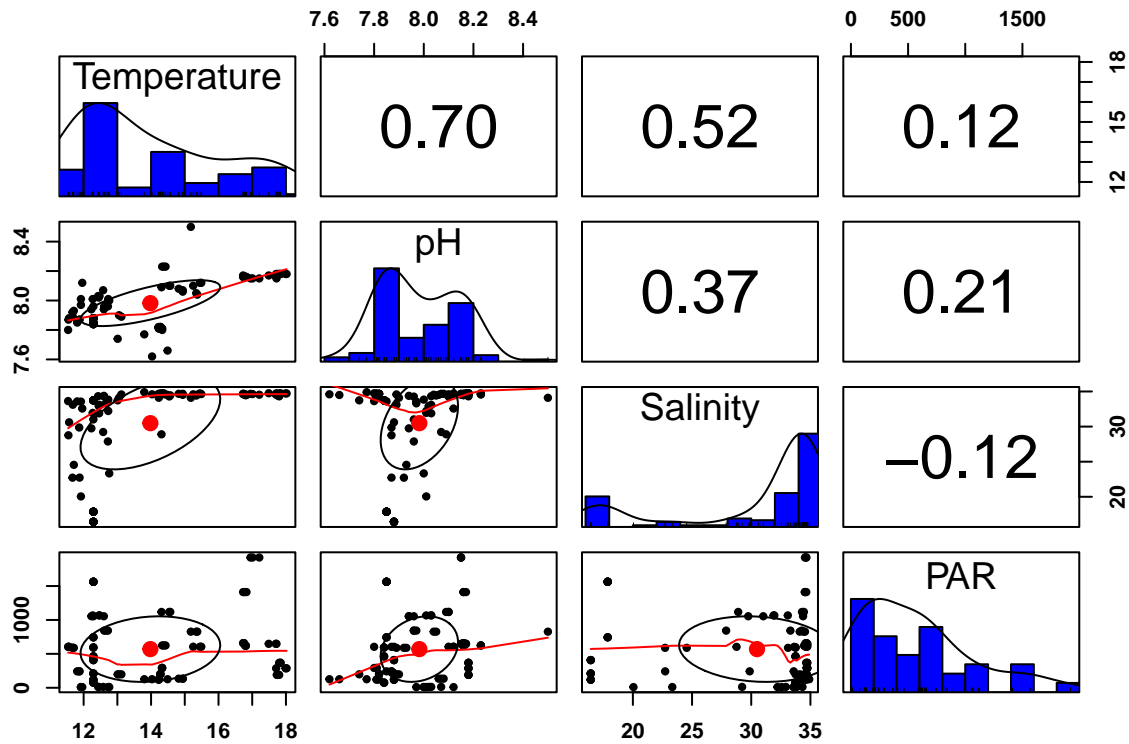
```
pairs.panels(Datos_Proyecto[,4:12], method = "pearson", hist.col = "blue", density = TRUE, font=4)
```



```
pairs.panels(Datos_Proyecto[,4:7], method = "pearson", hist.col = "blue", density = TRUE, font=2)
```

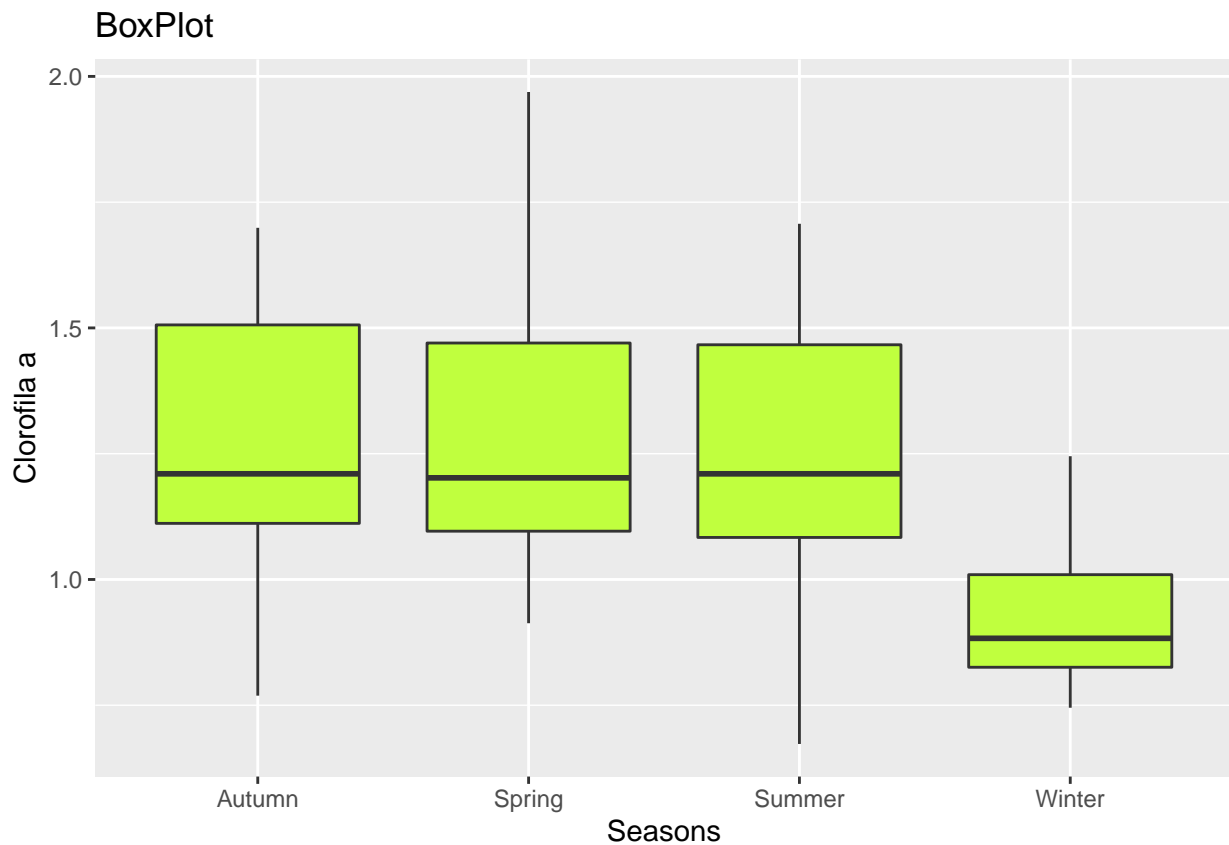


```
pairs.panels(Datos_Proyecto[,9:12], method = "pearson", hist.col = "blue", density = TRUE, font=2)
```

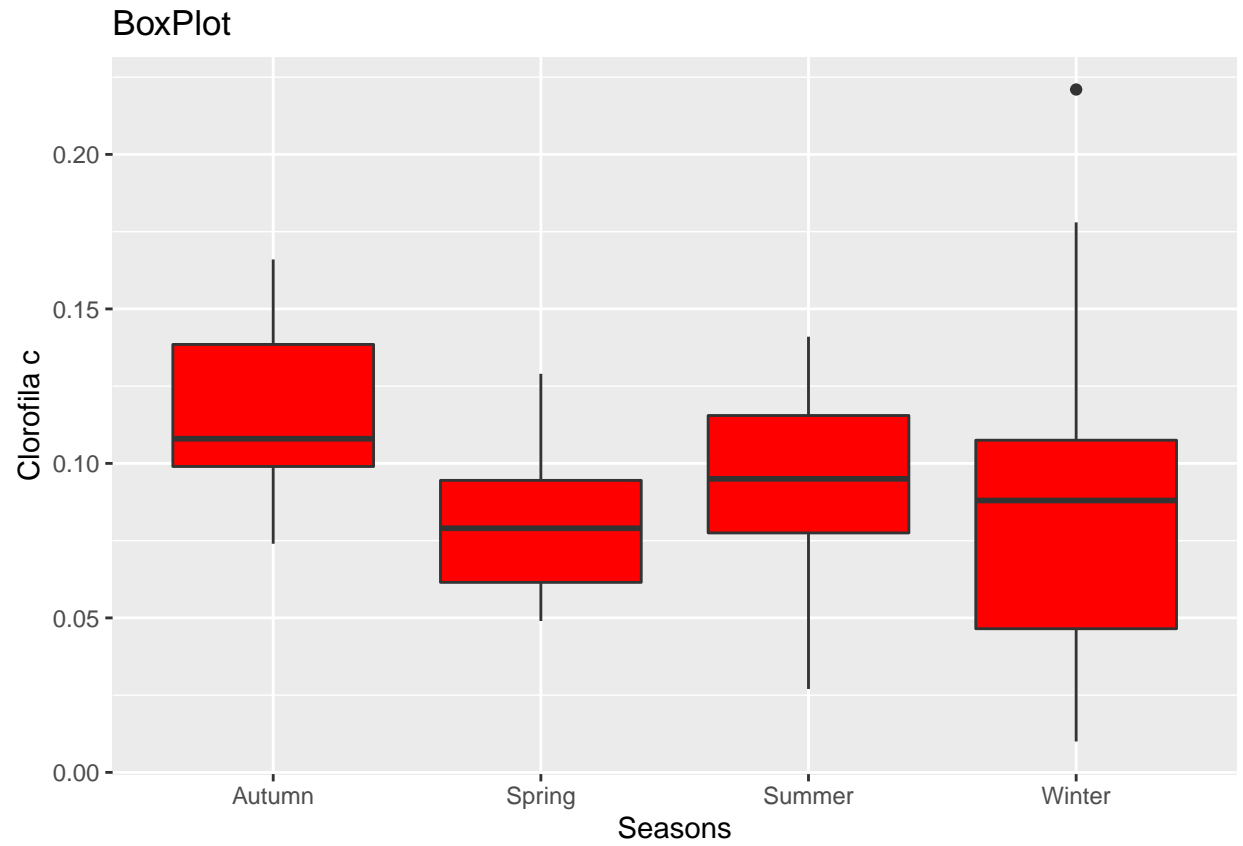


## 5. Relación entre variables continuas y factores (boxplot)

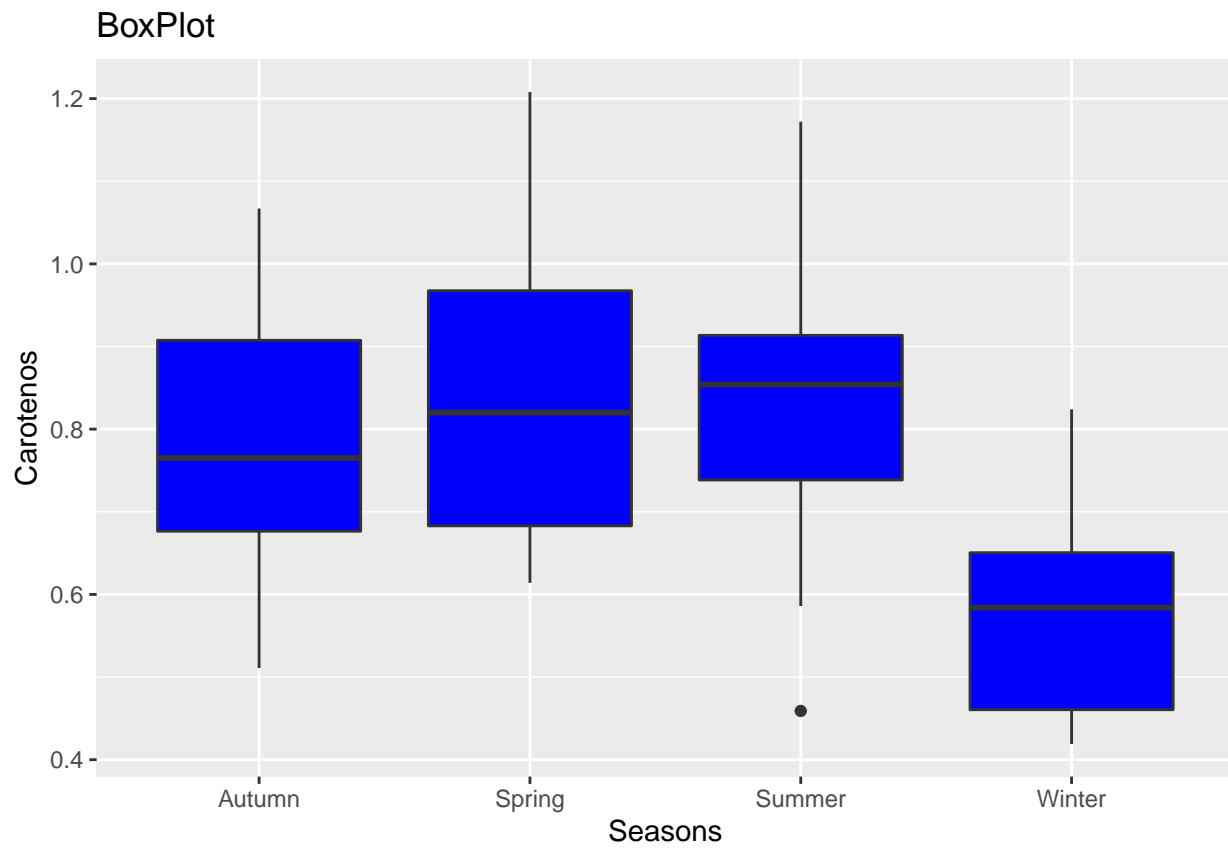
```
ggplot(Datos_Proyecto, aes(x= Seasons, y=Chla))+geom_boxplot(fill="olivedrab1")+labs(title = "BoxPlot",
```



```
ggplot(Datos_Proyecto, aes(x= Seasons, y=Chlc))+geom_boxplot(fill="red")+labs(title = "BoxPlot", x= "Se
```

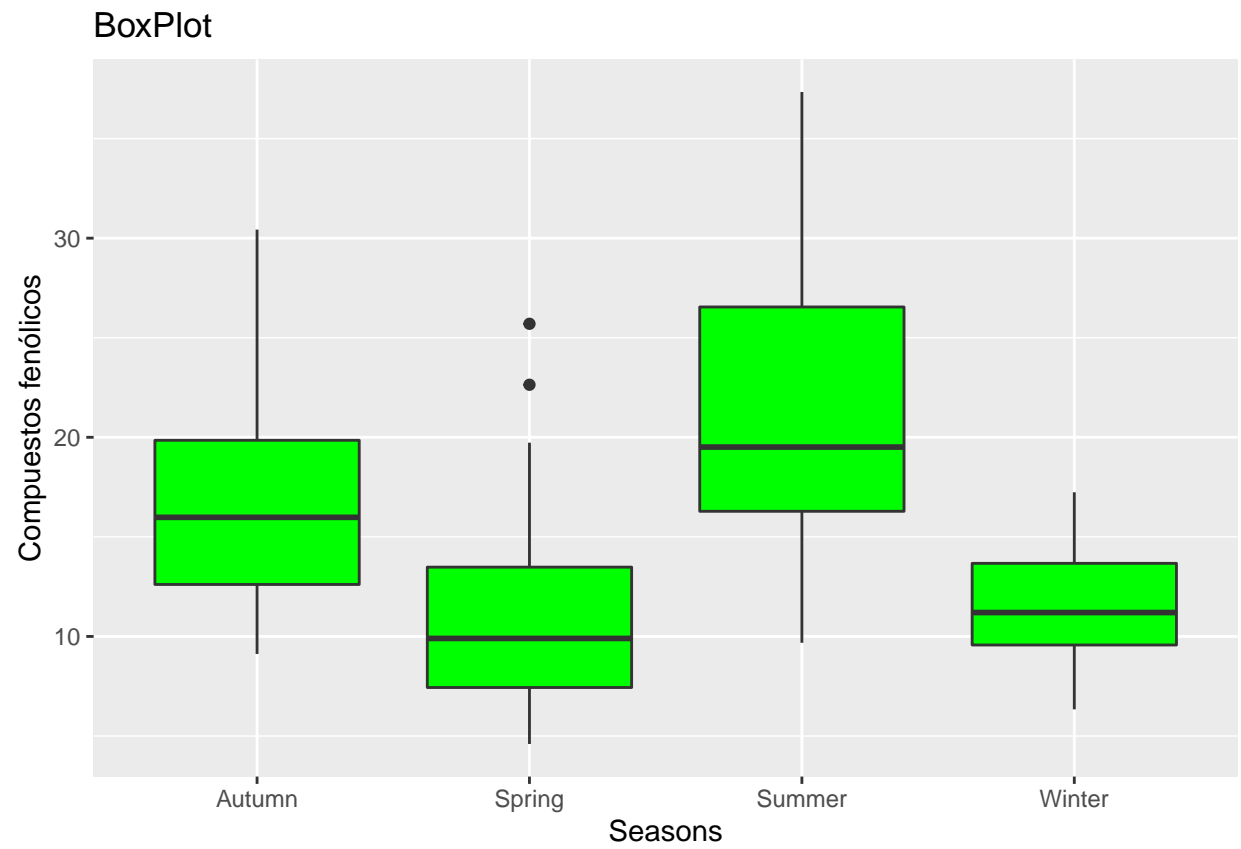


```
ggplot(Datos_Proyecto, aes(x= Seasons, y=Car))+geom_boxplot(fill="blue")+labs(title = "BoxPlot", x= "Se
```

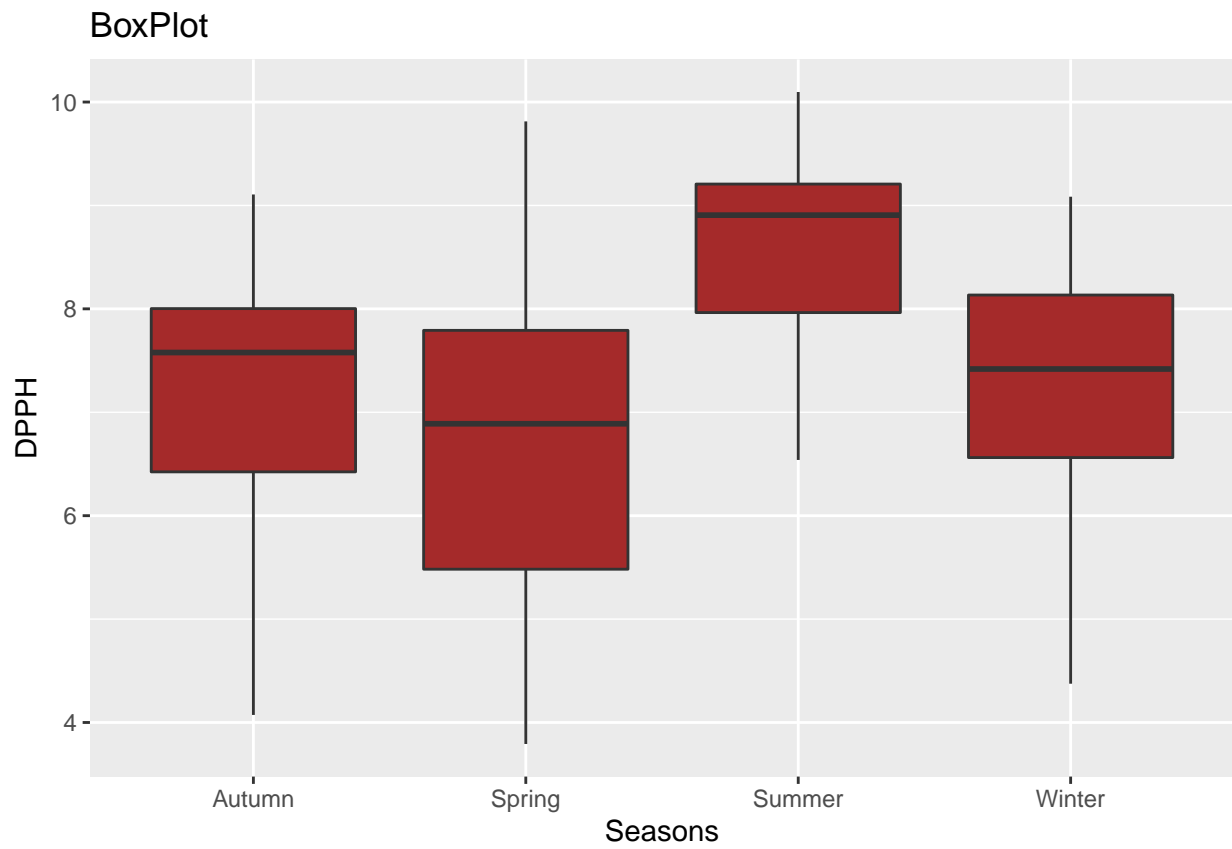


```
ggplot(Datos_Proyecto, aes(x= Seasons, y=PC))+geom_boxplot(fill="green")+labs(title = "BoxPlot", x= "Seasons")
```

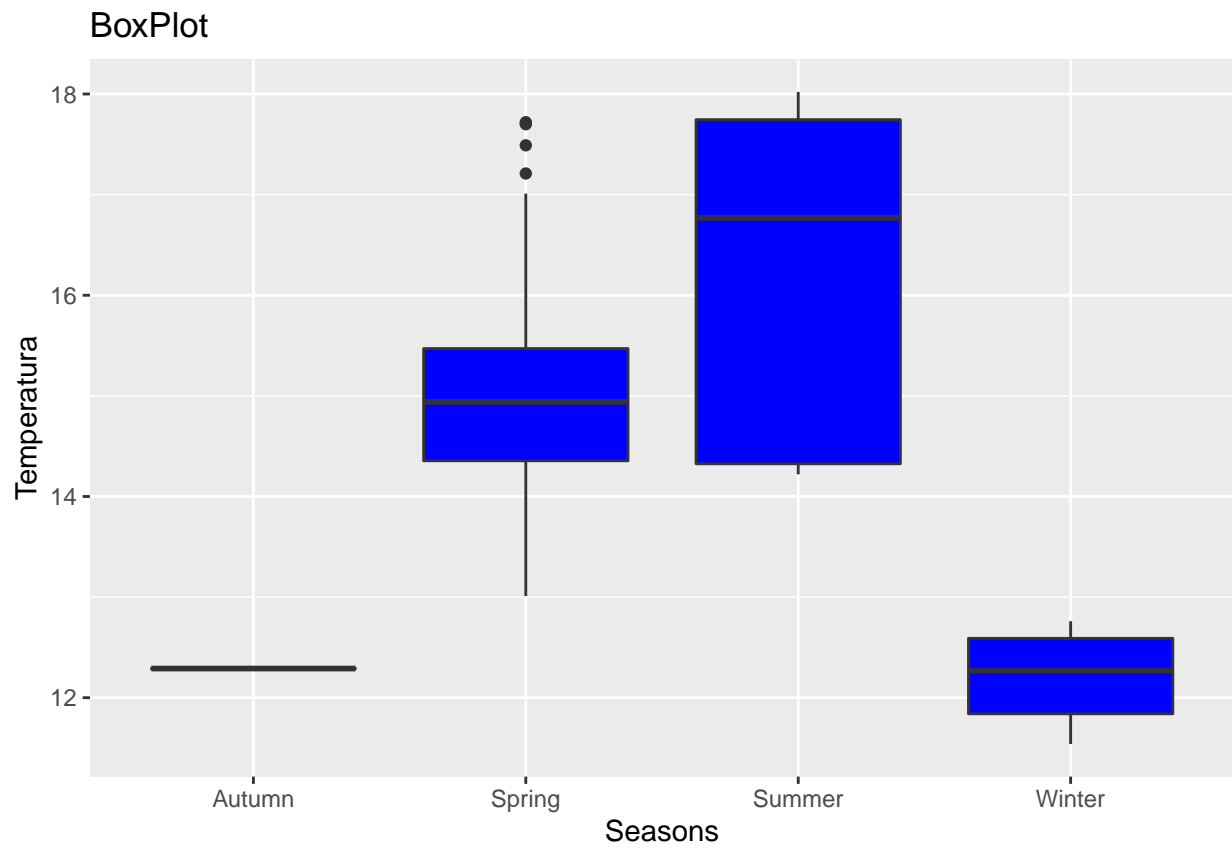




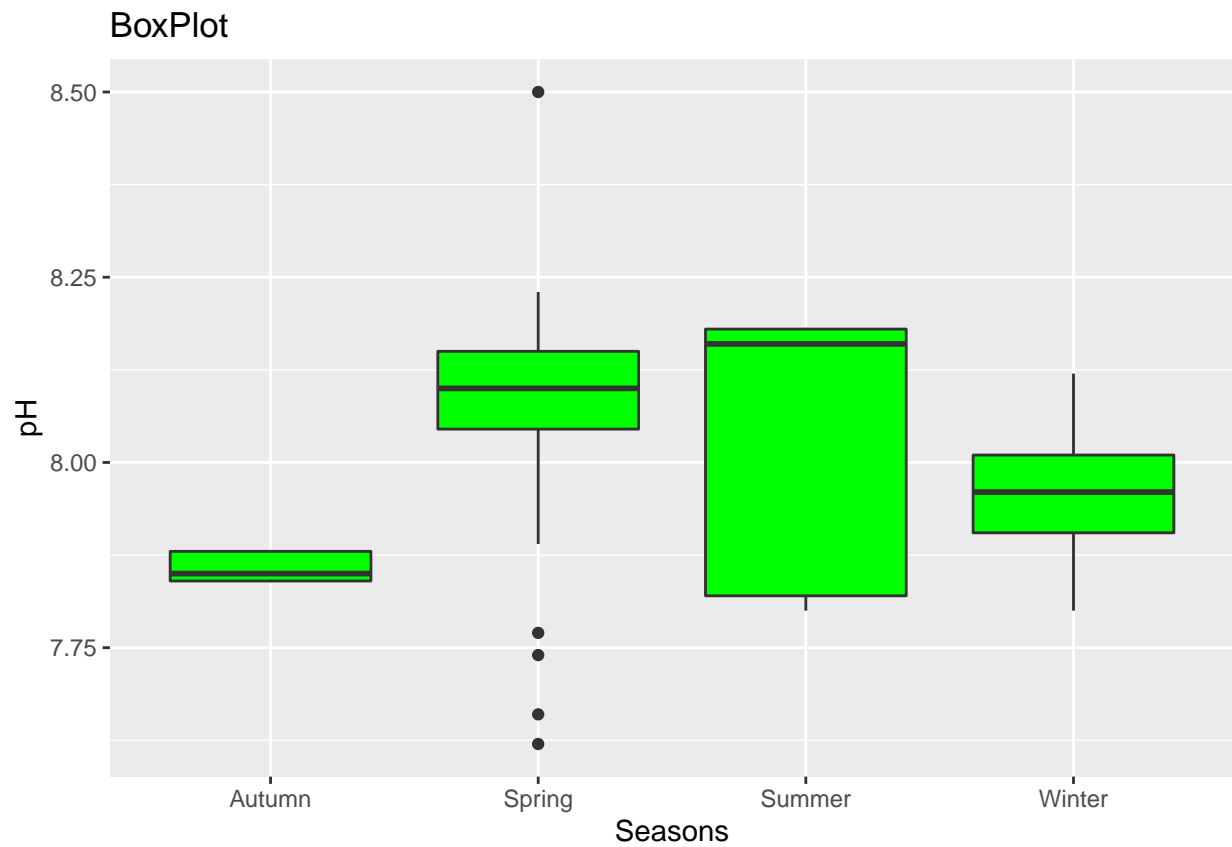
```
ggplot(Datos_Proyecto, aes(x= Seasons, y=DPPH))+geom_boxplot(fill="brown")+labs(title = "BoxPlot", x= "Seasons", y= "Compuestos fenólicos")
```



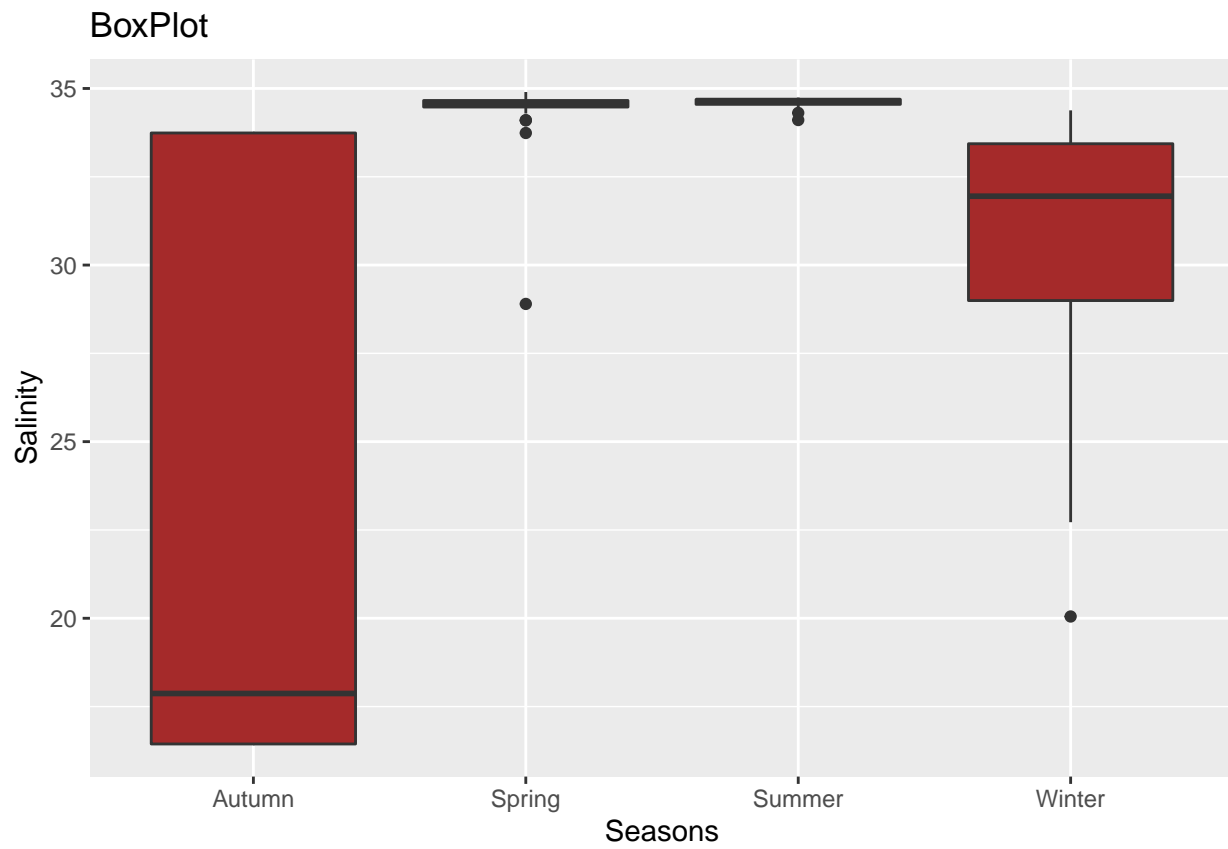
```
ggplot(Datos_Proyecto, aes(x= Seasons, y=Temperature))+geom_boxplot(fill="blue")+labs(title = "BoxPlot")
```



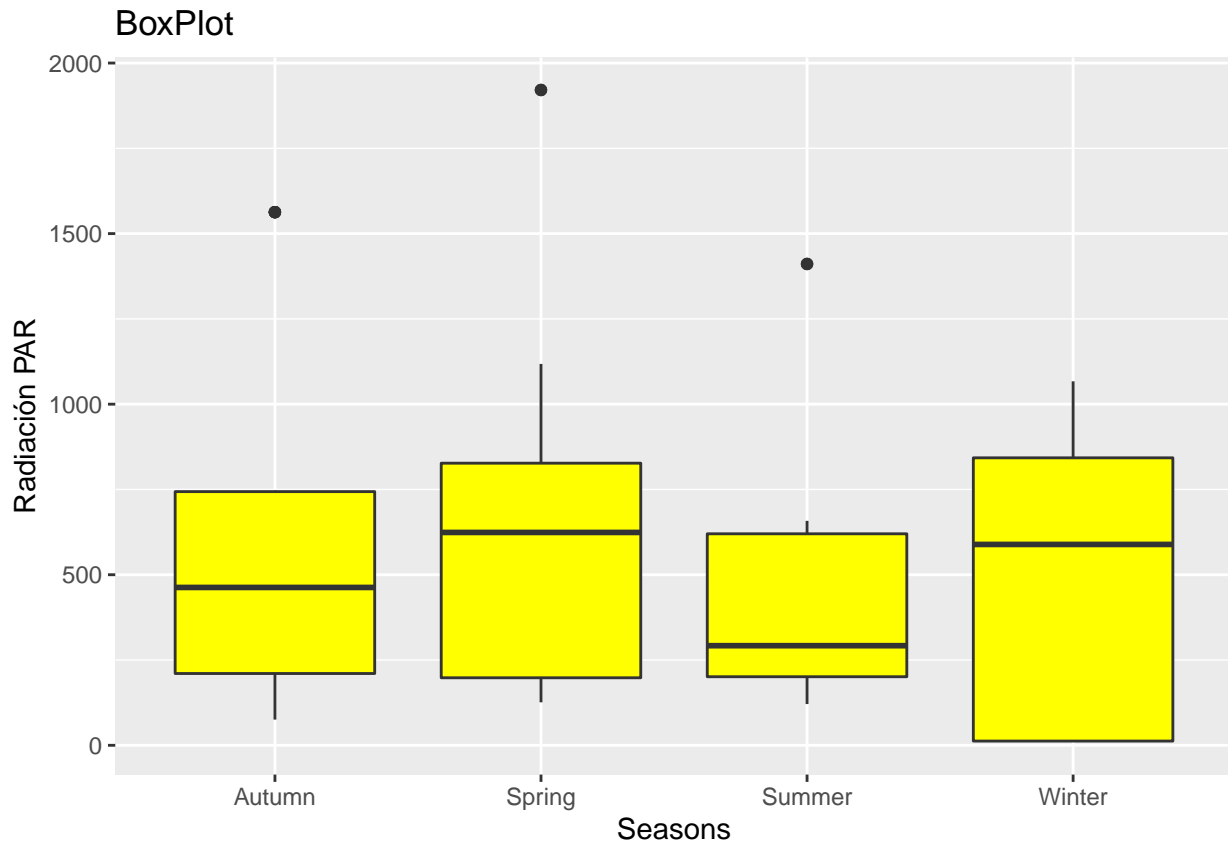
```
ggplot(Datos_Proyecto, aes(x= Seasons, y=pH))+geom_boxplot(fill="green")+labs(title = "BoxPlot", x= "Se
```



```
ggplot(Datos_Proyecto, aes(x= Seasons, y=Salinity))+geom_boxplot(fill="brown")+labs(title = "BoxPlot",
```



```
ggplot(Datos_Proyecto, aes(x= Seasons, y=PAR))+geom_boxplot(fill="yellow")+labs(title = "BoxPlot", x= "Seasons", y= "PAR")
```



## 6. Identificación de outliers o error atípico

Variable Chlc : para la estación winter se registra un outlier  
 Variable Car : para la estación summer se registra un outlier  
 Variable PC : se registran 2 valores en Spring  
 Variable Temperature: 3 valores en spring  
 Variable pH : 5 valores en spring  
 Variable Salinity: 3 valores en spring, 2 en summer y 1 en winter  
 Variable PAR: 1 en autumn, 1 en spring y 1 en summer

## 7. Resumen de los datos con tablas y estadística descriptiva

### Habilita librerías

```
library(readxl)
library(tidyr)
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

library(ggplot2)
```

```
Datos_Proyecto <- read_excel("Datos_Proyecto.xlsx" , sheet= 1)
head(Datos_Proyecto)
```

```
## # A tibble: 6 x 12
##   Seasons time Replicate Chla Chlc Car PC DPPH Temperat~1 pH Salin~2
##   <chr> <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 Autumn day 1 R1      1.04 0.095 0.605 9.12 7.58      12.3 7.84 33.7
## 2 Autumn day 1 R2      1.60 0.155 0.954 13.9 6.08      12.3 7.84 33.7
## 3 Autumn day 1 R3      1.52 0.143 0.931 15.8 7.81      12.3 7.84 33.7
## 4 Autumn day 1 R4      1.48 0.152 0.905 19.9 7.02      12.3 7.85 17.9
## 5 Autumn day 1 R5      1.14 0.108 0.694 19.8 7.20      12.3 7.85 17.9
## 6 Autumn day 1 R6      1.17 0.115 0.752 21.6 5.12      12.3 7.85 17.9
## # ... with 1 more variable: PAR <dbl>, and abbreviated variable names
## # 1: Temperature, 2: Salinity
```

```
Datos_Proyecto$Seasons <- as.factor(Datos_Proyecto$Seasons)
Datos_Proyecto$time <- as.factor(Datos_Proyecto$time)
Datos_Proyecto$Replicate <- as.factor(Datos_Proyecto$Replicate)
```

```
select(Datos_Proyecto, Chla, Chlc, Car, DPPH)
```

```
## # A tibble: 108 x 4
##   Chla Chlc Car DPPH
##   <dbl> <dbl> <dbl> <dbl>
## 1 1.04 0.095 0.605 7.58
## 2 1.60 0.155 0.954 6.08
## 3 1.52 0.143 0.931 7.81
## 4 1.48 0.152 0.905 7.02
## 5 1.14 0.108 0.694 7.20
## 6 1.17 0.115 0.752 5.12
## 7 1.38 0.148 0.884 6.24
## 8 1.17 0.105 0.659 6.47
## 9 1.08 0.102 0.62 6.38
## 10 1.49 0.134 0.937 4.07
## # ... with 98 more rows
```

```
Datos_tab <- Datos_Proyecto %>% group_by(Seasons) %>% summarize(n = n(),
Promedio_Chla = mean(Chla), Maximo_Chla = max(Chla), Promedio_Chlc = mean(Chlc), Maximo_Chlc = max(Chlc))
```

```
Datos_tab2 <- Datos_Proyecto %>% group_by(time) %>% summarize(n = n(),
Promedio_Chla = mean(Chla), Maximo_Chla = max(Chla), Promedio_Chlc = mean(Chlc), Maximo_Chlc = max(Chlc))
```

## 8. Utiliza Paquetes para importar datos a R como readxl o similar y paquetes tidyr, dplyr, ggplot2

### Habilita librerías

```
library(readxl)
library(tidyr)
library(dplyr)
library(ggplot2)
```

```
Datos_Proyecto2 <- read_excel("Datos_Proyecto2.xlsx" , sheet= 1)
summary(Datos_Proyecto2)
```

```
##      Sample_id          Chla          Chlc          Car
## Min.   : 1.00    Min.   :0.6730    Min.   :0.01000    Min.   :0.4190
## 1st Qu.: 27.75    1st Qu.:0.9888    1st Qu.:0.06775    1st Qu.:0.6240
## Median : 54.50    Median :1.1660    Median :0.09500    Median :0.7520
## Mean   : 54.50    Mean   :1.1856    Mean   :0.09365    Mean   :0.7557
## 3rd Qu.: 81.25    3rd Qu.:1.3813    3rd Qu.:0.10975    3rd Qu.:0.8780
## Max.   :108.00    Max.   :1.9690    Max.   :0.22100    Max.   :1.2080
##      PC          DPPH          Temperature          pH
## Min.   : 4.600    Min.   : 3.792    Min.   :11.54    Min.   :7.620
## 1st Qu.: 9.953    1st Qu.: 6.539    1st Qu.:12.29    1st Qu.:7.850
## Median :13.815    Median : 7.769    Median :12.88    Median :7.960
## Mean   :15.153    Mean   : 7.444    Mean   :13.98    Mean   :7.982
## 3rd Qu.:18.990    3rd Qu.: 8.433    3rd Qu.:15.35    3rd Qu.:8.150
## Max.   :37.340    Max.   :10.097    Max.   :18.02    Max.   :8.500
##      Salinity          PAR
## Min.   :16.44    Min.   : 9.768
## 1st Qu.:29.62    1st Qu.:196.000
## Median :34.10    Median :525.793
## Mean   :30.49    Mean   :569.983
## 3rd Qu.:34.63    3rd Qu.:764.500
## Max.   :34.90    Max.   :1921.000
```

```
messy <- read_excel("Datos_Proyecto2.xlsx")
summary(messy)
```

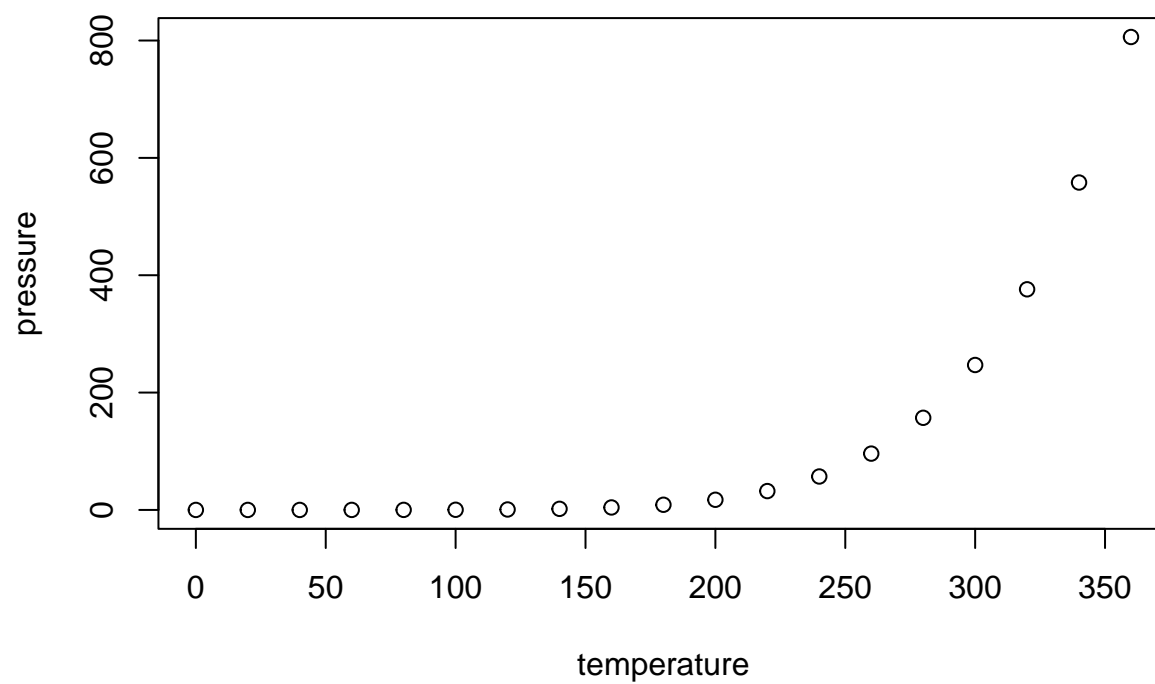
```
##      Sample_id          Chla          Chlc          Car
## Min.   : 1.00    Min.   :0.6730    Min.   :0.01000    Min.   :0.4190
## 1st Qu.: 27.75    1st Qu.:0.9888    1st Qu.:0.06775    1st Qu.:0.6240
## Median : 54.50    Median :1.1660    Median :0.09500    Median :0.7520
## Mean   : 54.50    Mean   :1.1856    Mean   :0.09365    Mean   :0.7557
## 3rd Qu.: 81.25    3rd Qu.:1.3813    3rd Qu.:0.10975    3rd Qu.:0.8780
## Max.   :108.00    Max.   :1.9690    Max.   :0.22100    Max.   :1.2080
##      PC          DPPH          Temperature          pH
## Min.   : 4.600    Min.   : 3.792    Min.   :11.54    Min.   :7.620
## 1st Qu.: 9.953    1st Qu.: 6.539    1st Qu.:12.29    1st Qu.:7.850
## Median :13.815    Median : 7.769    Median :12.88    Median :7.960
## Mean   :15.153    Mean   : 7.444    Mean   :13.98    Mean   :7.982
## 3rd Qu.:18.990    3rd Qu.: 8.433    3rd Qu.:15.35    3rd Qu.:8.150
## Max.   :37.340    Max.   :10.097    Max.   :18.02    Max.   :8.500
##      Salinity          PAR
## Min.   :16.44    Min.   : 9.768
## 1st Qu.:29.62    1st Qu.:196.000
## Median :34.10    Median :525.793
## Mean   :30.49    Mean   :569.983
## 3rd Qu.:34.63    3rd Qu.:764.500
## Max.   :34.90    Max.   :1921.000
```

```
Datos_Proyecto2_factor <- read_excel("Datos_Proyecto2.xlsx" , sheet= 2)
Datos_Proyecto2_factor$Seasons <- as.factor(Datos_Proyecto2_factor$Seasons)
Datos_Proyecto2_factor$time <- as.factor(Datos_Proyecto2_factor$time)
Datos_Proyecto2_factor$Replicate <- as.factor(Datos_Proyecto2_factor$Replicate)
```

```
inner_data <- inner_join(Datos_Proyecto2, Datos_Proyecto2_factor, "Sample_id")
right_data <- right_join(Datos_Proyecto2, Datos_Proyecto2_factor, "Sample_id")
full_data <- full_join(Datos_Proyecto2, Datos_Proyecto2_factor, "Sample_id")
```



“ You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.