BIPLOT

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2022-05-07

#BIPLOT

#Instalacion de paquetes

```
library(MultBiplotR)
```

```
## Warning: package 'MultBiplotR' was built under R version 4.1.3
```

Reconocimiento de la matriz de datos

```
load("Vinos.rda")
BD<-Vinos
```

Exploracion de matriz

```
dim(BD)
```

```
## [1] 45 21
```

```
str(BD)
```

```
## 'data.frame':    45 obs. of  21 variables:
##  $ a_o     : Factor w/ 2 levels "1986","1987": 1 1 1 1 1 1 1 1 1 1 ...
##  $ denomina: Factor w/ 2 levels "RIBERA","TORO": 1 1 1 1 1 1 1 1 1 1 ...
##  $ grupo   : Factor w/ 4 levels "RD86","RD87",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ grado   : num  12.8 12.8 12.5 11.9 12.5 12.1 12.2 12.6 13 12.4 ...
##  $ avol    : num  1.2 0.75 1 0.7 0.95 0.5 0.8 0.4 0.4 0.35 ...
##  $ atot    : num  6.7 6.9 7.2 7.7 7.7 5.8 5.9 5.4 4.6 5.5 ...
##  $ acfi    : num  5.2 6 6 6.8 6.3 5.2 4.9 4.9 4.1 5 ...
##  $ ph      : num  3.7 3.5 3.6 3.3 3.6 3.2 3.4 3.3 3.6 3.3 ...
##  $ folin   : num  2827 1818 1459 2054 2930 ...
##  $ somers  : num  50.8 37.8 35.1 32.1 49.6 30.6 35.6 30.6 41.7 30 ...
##  $ srv     : num  811 968 866 978 1128 ...
##  $ procian : num  3794 1736 2306 3420 3158 ...
##  $ acrg    : num  386 144 225 204 214 167 252 315 293 152 ...
```

```
##  $ acse    : num  287 141 132 110 148 95 160 124 170 67 ...
##  $ achplc  : num  181 69 78 84 75 74 101 101 137 56 ...
##  $ ic      : num  7.81 4.88 5.52 4.64 6.99 3.98 7.6 6.15 6.6 5.49 ...
##  $ ic2     : num  8.95 5.55 6.35 5.15 7.87 4.36 8.84 7.11 7.85 6.23 ...
##  $ tono    : num  0.72 0.755 0.456 0.675 0.672 0.716 0.716 0.74 0.93 0.75 ...
##  $ iim     : num  18.4 23.6 36.8 36.4 34.2 38.1 28.5 27.7 21.6 30.3 ...
##  $ eq1     : num  0.489 0.48 0.598 0.42 0.45 0.434 0.501 0.566 0.557 0.689 ...
##  $ vla     : num  0.21 0.56 0.38 0.29 0.36 0.3 0.24 0.4 0.28 0.26 ...
##  - attr(*, "variable.labels")= Named chr [1:21] "A„O" "DENOMINACION" "" "" ...
##   ..- attr(*, "names")= chr [1:21] "a_o" "denomina" "grupo" "grado" ...
##  - attr(*, "codepage")= int 28605
```

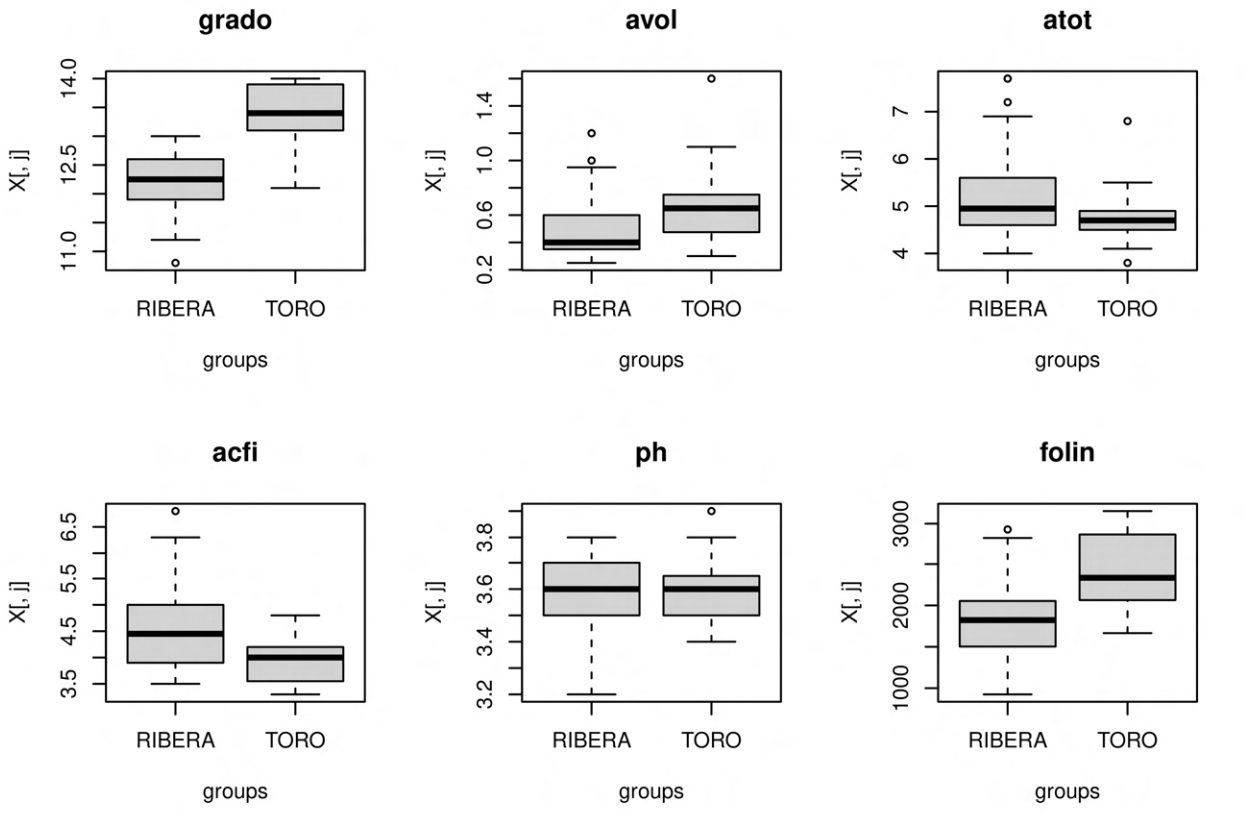
```
colnames(BD)
```

```
##  [1] "a_o"      "denomina" "grupo"    "grado"    "avol"     "atot"
##  [7] "acfi"     "ph"       "folin"    "somers"   "srv"      "procian"
## [13] "acrg"     "acse"     "achplc"   "ic"       "ic2"      "tono"
## [19] "iim"      "eq1"      "vla"
```

#Graficos de exploracion

```
BX1<-BoxPlotPanel(BD[,4:9], nrows=2, groups=BD$denomina)
```

```
## [1] 2
```

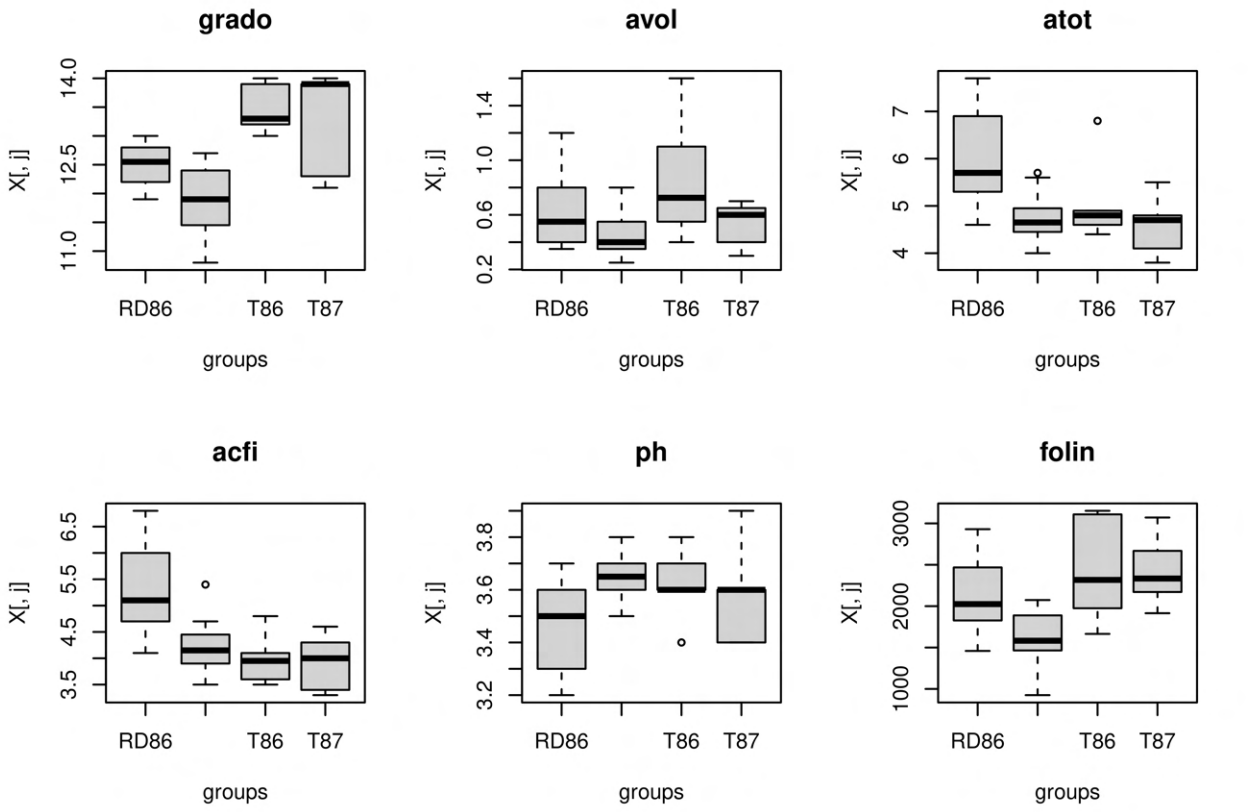


```
BX1
```

```
## $mfrow
## [1] 2 3
```

```
BX2<-BoxPlotPanel(BD[,4:9], nrows=2, groups=BD$grupo)
```

```
## [1] 2
```




```
BX2
```

```
## $mfrow
## [1] 2 3
```

en estos graficos podemos ver en BX1 los grados son distintos, lo que son casi iguales son atot, ph. mientras que en el grafico BX2 podemos ver que ph y avol son los que mas similitud tienen

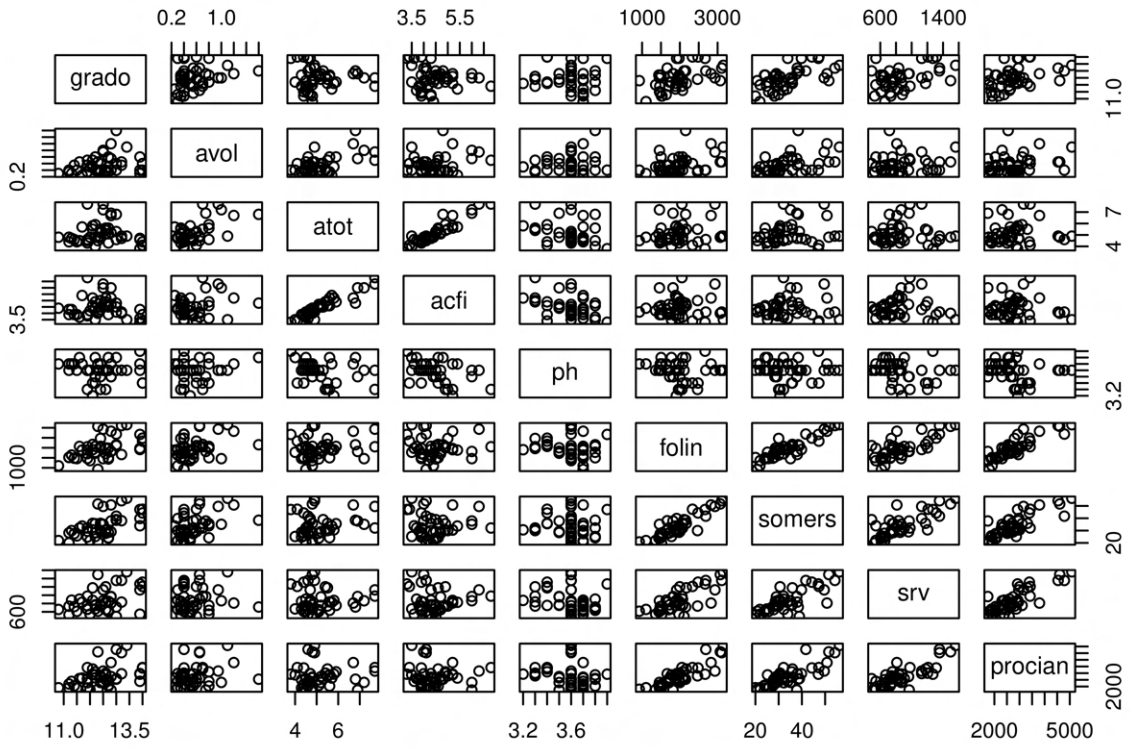
Filtrado de variables

##1.- Seleccion de variables numericas

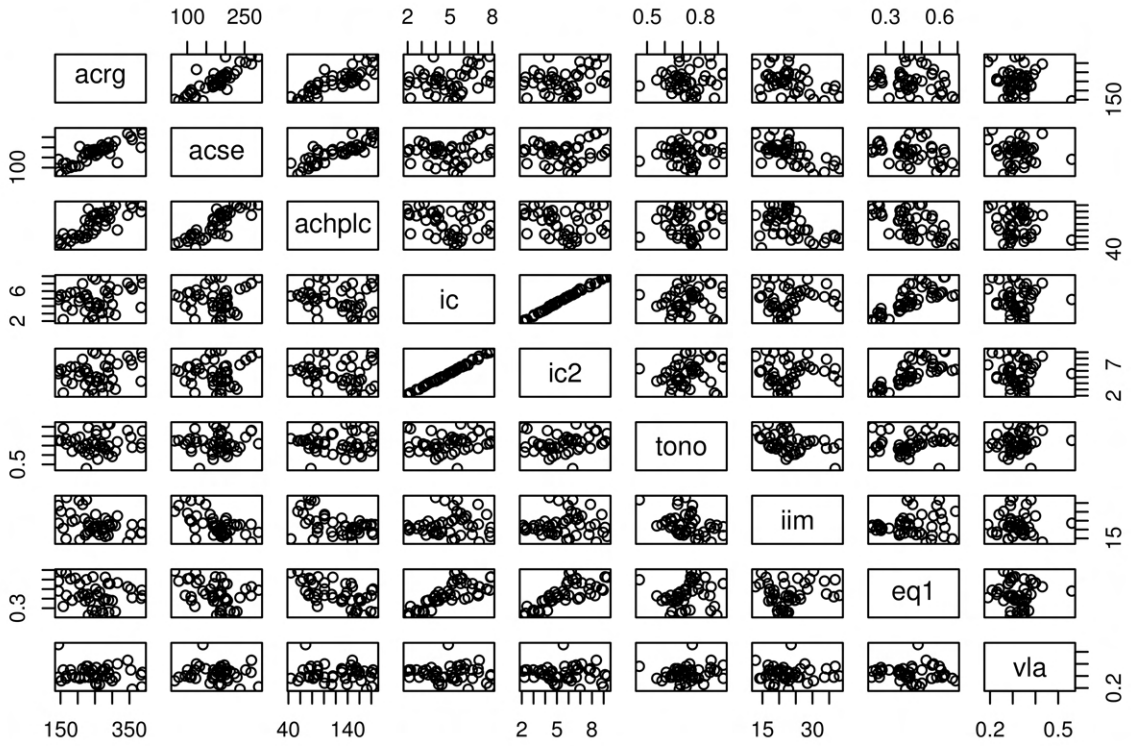
```
X<-BD[,4:21]
```

2.- Generacion Plot

```
PL1<-plot(X[,1:9])
```




```
PL2<-plot(X[,10:18])
```



en este grafico podemos ver como se comportan los datos unos con otros.

Reduccion de la dimensionalidad

1.- ACP Scaling= 1: datos orginales, 2: Resta la media global del conjunto de los datos, 3: Doble centrado (agricultura / interaccion de resuduales) 4: Centrado por columnas (variables con misma escala) 5: Estandarizado por columnas

```
acpvino<-PCA.Analysis(X,Scaling = 5)
summary(acpvino)
```

```
##  ###### Principal Components Analysis #######
##
## Transformation of the raw data:
## [1] "Standardize columns"
##
##  Eigenvalues & Explained Variance (Inertia)
##      Eigenvalue Exp. Var Cummulative
## [1,]  277.12688   34.991      34.991
## [2,]  199.36534   25.172      60.163
## [3,]   85.42317   10.786      70.949
##
##
##  STRUCTURE OF THE PRINCIPAL COMPONENTS
##          Dim 1  Dim 2  Dim 3
```

```
## grado   -0.676 -0.142  0.188
## avol    -0.450  0.204 -0.519
## atot    -0.225  0.738 -0.526
## acfi    -0.063  0.797 -0.397
## ph       0.191 -0.593 -0.193
## folin   -0.910 -0.094 -0.072
## somers  -0.920 -0.154 -0.090
## srv     -0.798 -0.088  0.277
## procian -0.873 -0.102  0.036
## acrg    -0.301 -0.726 -0.441
## acse    -0.213 -0.856 -0.372
## achplc   0.119 -0.830 -0.355
## ic      -0.926  0.117 -0.074
## ic2     -0.932  0.095 -0.048
## tono    -0.351 -0.290  0.612
## iim      0.021  0.810 -0.179
## eq1     -0.688  0.416  0.255
## vla      0.006  0.071  0.368
```

Presentacion de tablas (markdown)

```
summary(acpvino, latex=TRUE)
```

```
##  ###### Principal Components Analysis #######
##
## Transformation of the raw data:
## [1] "Standardize columns"
##
##  Eigenvalues & Explained Variance (Inertia)
##      Eigenvalue Exp. Var Cummulative
## [1,]  277.12688   34.991      34.991
## [2,]  199.36534   25.172      60.163
## [3,]   85.42317   10.786      70.949
##
##
##  STRUCTURE OF THE PRINCIPAL COMPONENTS
##          Dim 1  Dim 2  Dim 3
## grado   -0.676 -0.142  0.188
## avol    -0.450  0.204 -0.519
## atot    -0.225  0.738 -0.526
## acfi    -0.063  0.797 -0.397
## ph       0.191 -0.593 -0.193
## folin   -0.910 -0.094 -0.072
## somers  -0.920 -0.154 -0.090
## srv     -0.798 -0.088  0.277
## procian -0.873 -0.102  0.036
## acrg    -0.301 -0.726 -0.441
## acse    -0.213 -0.856 -0.372
## achplc   0.119 -0.830 -0.355
## ic      -0.926  0.117 -0.074
## ic2     -0.932  0.095 -0.048
## tono    -0.351 -0.290  0.612
## iim      0.021  0.810 -0.179
```

```
## eq1     -0.688  0.416  0.255
## vla      0.006  0.071  0.368
## % latex table generated in R 4.1.2 by xtable 1.8-4 package
## % Sat May 07 14:28:40 2022
## \begin{table}[ht]
## \centering
## \begin{tabular}{rrrr}
##   \hline
##  & Eigenvalue & Exp. Var & Cummulative \\
##   \hline
## 1 & 277.13 & 34.99 & 34.99 \\
##   2 & 199.37 & 25.17 & 60.16 \\
##   3 & 85.42 & 10.79 & 70.95 \\
##    \hline
## \end{tabular}
## \caption{Explained Variance}
## \end{table}
## % latex table generated in R 4.1.2 by xtable 1.8-4 package
## % Sat May 07 14:28:41 2022
## \begin{table}[ht]
## \centering
## \begin{tabular}{rrrr}
##   \hline
##  & Dim 1 & Dim 2 & Dim 3 \\
##   \hline
## grado & -0.68 & -0.14 & 0.19 \\
##   avol & -0.45 & 0.20 & -0.52 \\
##   atot & -0.22 & 0.74 & -0.53 \\
##   acfi & -0.06 & 0.80 & -0.40 \\
##   ph & 0.19 & -0.59 & -0.19 \\
##   folin & -0.91 & -0.09 & -0.07 \\
##   somers & -0.92 & -0.15 & -0.09 \\
##   srv & -0.80 & -0.09 & 0.28 \\
##   procian & -0.87 & -0.10 & 0.04 \\
##   acrg & -0.30 & -0.73 & -0.44 \\
##   acse & -0.21 & -0.86 & -0.37 \\
##   achplc & 0.12 & -0.83 & -0.35 \\
##   ic & -0.93 & 0.12 & -0.07 \\
##   ic2 & -0.93 & 0.10 & -0.05 \\
##   tono & -0.35 & -0.29 & 0.61 \\
##   iim & 0.02 & 0.81 & -0.18 \\
##   eq1 & -0.69 & 0.42 & 0.26 \\
##   vla & 0.01 & 0.07 & 0.37 \\
##    \hline
## \end{tabular}
## \caption{Correlations with the Principal Components}
## \end{table}
```

2.- Contenido del objeto acpvino

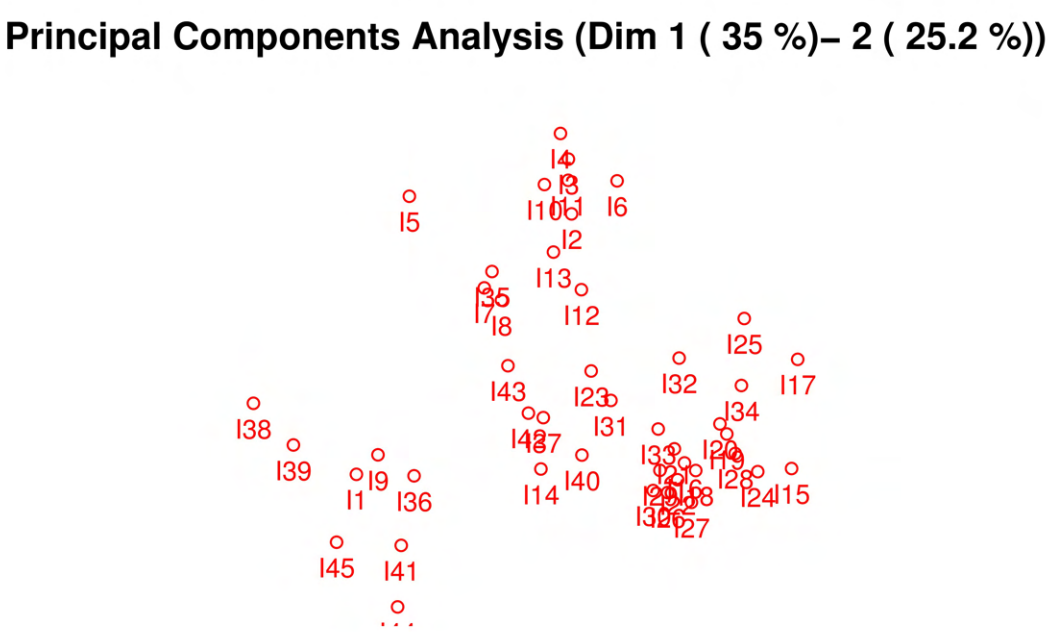
```
names(acpvino)
```

```
##  [1] "Title"                 "Type"                  "call"
```

```
##  [4] "Non_Scaled_Data"       "alpha"                "Dimension"
##  [7] "Means"                 "Medians"              "Deviations"
## [10] "Minima"                "Maxima"               "P25"
## [13] "P75"                   "GMean"                "Initial_Transformation"
## [16] "Scaled_Data"           "nrows"                "ncols"
## [19] "nrowsSup"              "ncolsSup"             "dim"
## [22] "EigenValues"           "Inertia"              "CumInertia"
## [25] "EV"                    "Structure"            "RowCoordinates"
## [28] "ColCoordinates"        "RowContributions"     "ColContributions"
## [31] "Scale_Factor"          "ClusterType"          "Clusters"
## [34] "ClusterColors"         "ClusterNames"
```

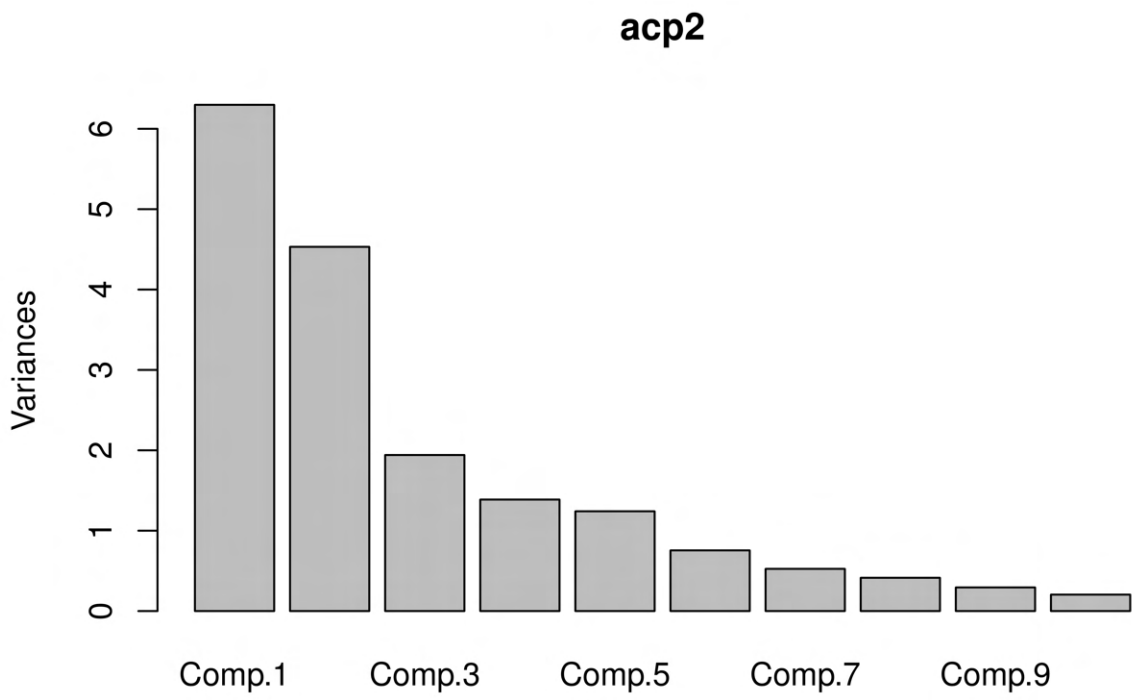
3.- Generacion del grafico

```
acp1<-plot(acpvino, ShowBox=FALSE)
```



screeplot con barras

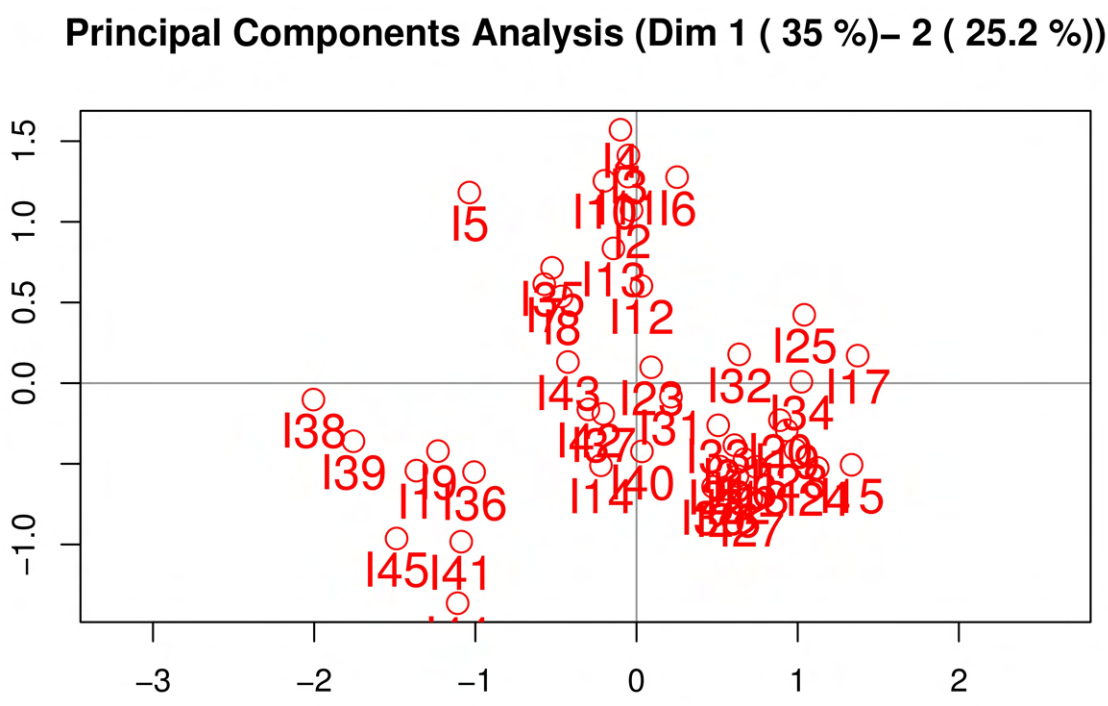
```
acp2<-princomp(X, cor=TRUE, score=TRUE)
plot(acp2)
```

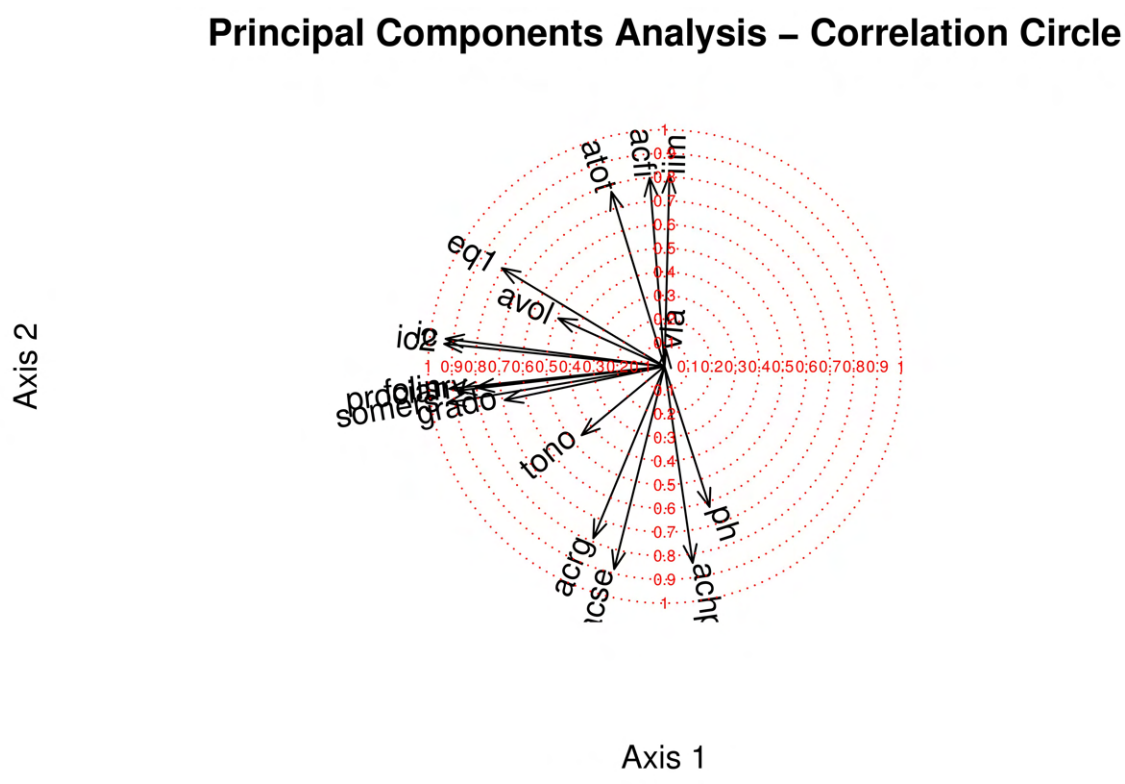


en el grafico de barras podemos ver de los componentes como se comportan

Grafico circular de correlacion

```
acp3<-plot(acpvino, CorrelationCircle=TRUE,
           ShowAxis=TRUE,  CexInd=1.5)
```


Principal Components Analysis (Dim 1 (35 %)– 2 (25.2 %))
1.5
1.0
0.5
0.0
−1.0
−3
−2
−1
0
1
2



agregar grupos al biplot definido por usuario

```
acpvino1<-AddCluster2Biplot(acpvino, ClusterType="us",
                            Groups = BD$grupo)
acpvino1
```

```
## $Title
## [1] "Principal Components Analysis"
##
## $Type
## [1] "PCA"
##
## $call
## PCA.Biplot(X = X, alpha = 1, dimension = dimension, Scaling = Scaling)
##
## $Non_Scaled_Data
##     grado avol atot acfi  ph folin somers  srv procian acrg acse achplc   ic
## I1   12.8 1.20  6.7  5.2 3.7  2827   50.8  811    3794  386  287    181 7.81
## I2   12.8 0.75  6.9  6.0 3.5  1818   37.8  968    1736  144  141     69 4.88
## I3   12.5 1.00  7.2  6.0 3.6  1459   35.1  866    2306  225  132     78 5.52
## I4   11.9 0.70  7.7  6.8 3.3  2054   32.1  978    3420  204  110     84 4.64
## I5   12.5 0.95  7.7  6.3 3.6  2930   49.6 1128    3158  214  148     75 6.99
## I6   12.1 0.50  5.8  5.2 3.2  1906   30.6  875    2931  167   95     74 3.98
## I7   12.2 0.80  5.9  4.9 3.4  2071   35.6  754    3101  252  160    101 7.60
## I8   12.6 0.40  5.4  4.9 3.3  1996   30.6 1202    3001  315  124    101 6.15
## I9   13.0 0.40  4.6  4.1 3.6  2687   41.7 1354    4785  293  170    137 6.60
```

```
## I10  12.4 0.35  5.5  5.0 3.3  2468   30.0  739    2800  152   67     56 5.49
## I11  12.6 0.35  5.6  5.2 3.3  1965   30.4  839    2878  144   78     61 5.25
## I12  12.2 0.40  4.8  4.4 3.5  1731   28.4  770    2649  193  107     75 5.86
## I13  12.8 0.40  5.2  4.7 3.5  1827   29.0  960    2746  179  101     65 5.77
## I14  13.0 0.60  5.3  4.5 3.6  2110   38.9  489    2587  358  238    172 6.29
## I15  12.3 0.40  4.5  4.1 3.7   925   20.8  615    1792  231  177    168 1.95
## I16  11.3 0.30  4.7  4.3 3.7  1637   30.0  881    2386  254  189    154 3.68
## I17  10.8 0.30  4.8  4.4 3.7  1103   21.9  658    1906  158  120     89 2.20
## I18  11.2 0.40  4.4  3.9 3.7  1528   28.2  735    2188  275  203    146 4.05
## I19  11.9 0.35  4.3  3.9 3.6  1468   24.8  666    1889  222  169    132 3.31
## I20  11.5 0.40  4.4  3.9 3.6  1462   25.7  612    1877  236  178    130 3.98
## I21  11.7 0.25  5.7  5.4 3.7  1887   33.7  830    2634  290  223    186 3.17
## I22  11.6 0.65  4.5  3.7 3.8  2071   32.1  906    2598  242  187    146 2.63
## I23  12.4 0.40  4.8  4.3 3.7  2074   35.9  770    2702  220  167    101 5.34
## I24  11.4 0.55  4.6  3.9 3.7  1481   27.5  726    2046  273  186    154 2.09
## I25  12.0 0.50  4.8  4.2 3.6  1359   22.0  543    1771  184  111     87 3.46
## I26  12.7 0.35  4.3  3.9 3.6  1981   28.6  853    2506  270  212    156 3.09
## I27  11.9 0.55  4.5  3.8 3.6  1890   29.5  748    2570  309  230    179 2.82
## I28  11.9 0.55  4.6  3.9 3.6  1706   32.2  659    2282  248  189    149 2.12
## I29  12.7 0.80  5.6  4.6 3.8  1503   24.2  637    2036  384  200    159 3.83
## I30  12.2 0.40  4.0  3.5 3.8  1778   25.2  670    2871  263  189    139 4.20
## I31  12.4 0.60  5.2  4.5 3.5  2000   29.2  756    2298  289  199    160 5.13
## I32  12.7 0.50  5.1  4.5 3.6  1444   23.9  606    2086  232  166    115 4.45
## I33  12.6 0.35  5.1  4.7 3.6  1706   27.8  652    2509  300  205    163 4.23
## I34  11.2 0.35  4.8  4.3 3.6  1515   20.0  528    1910  258  168    136 3.98
## I35  13.0 1.60  6.8  4.8 3.8  2153   38.4  716    2547  166  122     44 5.34
## I36  14.0 0.40  4.4  3.9 3.4  2481   44.3 1313    3392  288  197    146 5.76
## I37  13.2 0.55  4.7  4.0 3.6  1665   38.0  834    2956  206  204     82 5.15
## I38  13.4 1.10  4.9  3.5 3.6  3152   56.2 1561    5082  244  174     90 7.91
## I39  13.2 0.65  4.9  4.1 3.6  3109   54.2 1355    4536  280  189    115 7.88
## I40  13.9 0.80  4.6  3.6 3.7  1975   33.9  544    2390  254  182    113 4.42
## I41  14.0 0.60  4.1  3.4 3.4  2334   47.3 1210    3422  354  253    183 6.58
## I42  13.9 0.30  4.7  4.3 3.6  1915   39.8 1128    2970  229  188     89 5.00
## I43  12.1 0.70  5.5  4.6 3.4  2171   35.9 1177    3313  280  202    130 6.04
## I44  13.9 0.40  3.8  3.3 3.9  2668   47.1 1270    2922  345  268    148 7.07
## I45  12.3 0.65  4.8  4.0 3.6  3071   51.6 1496    4600  388  267    180 7.01
##      ic2  tono  iim   eq1  vla
## I1  8.95 0.720 18.4 0.489 0.21
## I2  5.55 0.755 23.6 0.480 0.56
## I3  6.35 0.456 36.8 0.598 0.38
## I4  5.15 0.675 36.4 0.420 0.29
## I5  7.87 0.672 34.2 0.450 0.36
## I6  4.36 0.716 38.1 0.434 0.30
## I7  8.84 0.716 28.5 0.501 0.24
## I8  7.11 0.740 27.7 0.566 0.40
## I9  7.85 0.930 21.6 0.557 0.28
## I10 6.23 0.750 30.3 0.689 0.26
## I11 5.96 0.756 33.6 0.584 0.29
## I12 6.65 0.770 25.6 0.614 0.29
## I13 6.65 0.748 29.2 0.607 0.35
## I14 6.97 0.682 22.8 0.411 0.19
## I15 2.11 0.893 22.4 0.227 0.34
## I16 4.19 0.859 21.3 0.274 0.37
## I17 2.44 0.880 20.7 0.319 0.35
```

```
## I18 4.57 0.674 17.8 0.382 0.34
## I19 3.74 0.706 16.9 0.376 0.35
## I20 4.46 0.665 19.2 0.371 0.33
## I21 3.53 0.695 22.8 0.257 0.32
## I22 2.99 0.742 20.6 0.280 0.35
## I23 6.01 0.633 26.1 0.435 0.29
## I24 2.32 0.685 19.7 0.247 0.35
## I25 3.96 0.640 24.7 0.383 0.31
## I26 3.42 0.717 19.5 0.274 0.34
## I27 3.04 0.640 22.2 0.265 0.29
## I28 2.23 0.631 21.2 0.222 0.29
## I29 4.31 0.680 18.0 0.404 0.31
## I30 4.81 0.687 17.1 0.470 0.23
## I31 5.74 0.608 24.9 0.386 0.33
## I32 4.93 0.606 24.1 0.410 0.29
## I33 4.62 0.584 22.8 0.380 0.26
## I34 4.34 0.555 22.1 0.429 0.28
## I35 6.06 0.774 14.7 0.670 0.28
## I36 6.64 0.930 16.7 0.559 0.39
## I37 5.85 0.790 14.2 0.554 0.28
## I38 9.12 0.746 21.2 0.629 0.31
## I39 9.30 0.828 16.1 0.624 0.30
## I40 5.02 0.819 18.6 0.444 0.23
## I41 7.74 0.790 17.2 0.501 0.35
## I42 5.67 0.720 18.3 0.445 0.38
## I43 6.81 0.659 26.4 0.397 0.36
## I44 8.37 0.861 12.9 0.525 0.43
## I45 8.26 0.854 23.0 0.432 0.33
##
## $alpha
## [1] 1
##
## $Dimension
## [1] 3
##
## $Means
##       grado         avol         atot         acfi           ph        folin
##   12.4600000    0.5666667    5.1600000    4.4533333    3.5822222 1979.1333333
##      somers          srv      procian         acrg         acse       achplc
##   34.0111111  875.2888889 2775.0888889  253.2888889  174.9333333  122.1777778
##          ic          ic2         tono          iim          eq1          vla
##    4.9044444    5.5797778    0.7252667   22.8933333    0.4438000    0.3191111
##
## $Medians
##    grado     avol     atot     acfi       ph    folin   somers      srv
##   12.400    0.500    4.800    4.300    3.600 1915.000   32.100  811.000
##  procian     acrg     acse   achplc       ic      ic2     tono      iim
## 2634.000  252.000  182.000  130.000    5.000    5.670    0.717   22.100
##      eq1      vla
##    0.434    0.310
##
## $Deviations
##       grado         avol         atot         acfi           ph        folin
##   0.78375553   0.27219645   0.93842227   0.77359844   0.15416769 521.38624664
```

```
##       somers          srv      procian         acrg         acse       achplc
##   9.26872116 272.87048395 799.99601767  64.48594710  50.26538661  40.49258568
##           ic          ic2         tono          iim          eq1          vla
##   1.65708473   1.97906600   0.09894245   6.09248419   0.12443063   0.06277022
##
## $Minima
##    grado     avol     atot     acfi       ph    folin   somers      srv
##   10.800    0.250    3.800    3.300    3.200  925.000   20.000  489.000
##  procian     acrg     acse   achplc       ic      ic2     tono      iim
## 1736.000  144.000   67.000   44.000    1.950    2.110    0.456   12.900
##      eq1      vla
##    0.222    0.190
##
## $Maxima
##    grado     avol     atot     acfi       ph    folin   somers      srv
##   14.000    1.600    7.700    6.800    3.900 3152.000   56.200 1561.000
##  procian     acrg     acse   achplc       ic      ic2     tono      iim
## 5082.000  388.000  287.000  186.000    7.910    9.300    0.930   38.100
##      eq1      vla
##    0.689    0.560
##
## $P25
##    grado     avol     atot     acfi       ph    folin   somers      srv
##   11.900    0.400    4.600    3.900    3.500 1637.000   28.200  666.000
##  procian     acrg     acse   achplc       ic      ic2     tono      iim
## 2282.000  214.000  141.000   87.000    3.830    4.310    0.672   18.400
##      eq1      vla
##    0.380    0.290
##
## $P75
##    grado     avol     atot     acfi       ph    folin   somers      srv
##   12.800    0.650    5.500    4.800    3.700 2153.000   38.400  978.000
##  procian     acrg     acse   achplc       ic      ic2     tono      iim
## 3001.000  289.000  202.000  154.000    6.040    6.810    0.774   25.600
##      eq1      vla
##    0.554    0.350
##
## $GMean
## [1] 348.6117
##
## $Initial_Transformation
## [1] "Standardize columns"
##
## $Scaled_Data
##           grado        avol        atot        acfi         ph        folin
## I1   0.43380874  2.32675087  1.64105227  0.96518637  0.7639589  1.626177660
## I2   0.43380874  0.67353315  1.85417594  1.99931462 -0.5333298 -0.309047917
## I3   0.05103632  1.59198744  2.17386145  1.99931462  0.1153145 -0.997596958
## I4  -0.71450852  0.48984229  2.70667062  3.03344287 -1.8306185  0.143591564
## I5   0.05103632  1.40829658  2.70667062  2.38711271  0.1153145  1.823727942
## I6  -0.45932690 -0.24492114  0.68199575  0.96518637 -2.4792628 -0.140267093
## I7  -0.33173610  0.85722400  0.78855758  0.57738827 -1.1819741  0.176196950
## I8   0.17862713 -0.61230286  0.25574841  0.57738827 -1.8306185  0.032349658
## I9   0.68899036 -0.61230286 -0.59674628 -0.45673998  0.1153145  1.357662714
```

```
## I10 -0.07655448 -0.79599372  0.36231024  0.70665430 -1.8306185  0.937628620
## I11  0.17862713 -0.79599372  0.46887208  0.96518637 -1.8306185 -0.027107223
## I12 -0.33173610 -0.61230286 -0.38362261 -0.06894188 -0.5333298 -0.475910776
## I13  0.43380874 -0.61230286  0.04262473  0.31885621 -0.5333298 -0.291786242
## I14  0.68899036  0.12246057  0.14918657  0.06032415  0.1153145  0.250997543
## I15 -0.20414529 -0.61230286 -0.70330811 -0.45673998  0.7639589 -2.021789681
## I16 -1.48005336 -0.97968458 -0.49018444 -0.19820791  0.7639589 -0.656199383
## I17 -2.11800739 -0.97968458 -0.38362261 -0.06894188  0.7639589 -1.680392107
## I18 -1.60764416 -0.61230286 -0.80986995 -0.71527204  0.7639589 -0.865257448
## I19 -0.71450852 -0.79599372 -0.91643179 -0.71527204  0.1153145 -0.980335282
## I20 -1.22487174 -0.61230286 -0.80986995 -0.71527204  0.1153145 -0.991843066
## I21 -0.96969013 -1.16337543  0.57543391  1.22371843  0.7639589 -0.176708407
## I22 -1.09728094  0.30615143 -0.70330811 -0.97380410  1.4126032  0.176196950
## I23 -0.07655448 -0.61230286 -0.38362261 -0.19820791  0.7639589  0.181950842
## I24 -1.35246255 -0.06123029 -0.59674628 -0.71527204  0.7639589 -0.955401752
## I25 -0.58691771 -0.24492114 -0.38362261 -0.32747395  0.1153145 -1.189393348
## I26  0.30621794 -0.79599372 -0.91643179 -0.71527204  0.1153145  0.003580199
## I27 -0.71450852 -0.06123029 -0.70330811 -0.84453807  0.1153145 -0.170954516
## I28 -0.71450852 -0.06123029 -0.59674628 -0.71527204  0.1153145 -0.523859874
## I29  0.30621794  0.85722400  0.46887208  0.18959018  1.4126032 -0.913206546
## I30 -0.33173610 -0.61230286 -1.23611729 -1.23233616  1.4126032 -0.385766473
## I31 -0.07655448  0.12246057  0.04262473  0.06032415 -0.5333298  0.040021513
## I32  0.30621794 -0.24492114 -0.06393710  0.06032415  0.1153145 -1.026366416
## I33  0.17862713 -0.79599372 -0.06393710  0.31885621  0.1153145 -0.523859874
## I34 -1.60764416 -0.79599372 -0.38362261 -0.19820791  0.1153145 -0.890190979
## I35  0.68899036  3.79627773  1.74761410  0.44812224  1.4126032  0.333469990
## I36  1.96489842 -0.61230286 -0.80986995 -0.71527204 -1.1819741  0.962562150
## I37  0.94417197 -0.06123029 -0.49018444 -0.58600601  0.1153145 -0.602496394
## I38  1.19935358  1.95936915 -0.27706077 -1.23233616  0.1153145  2.249515928
## I39  0.94417197  0.30615143 -0.27706077 -0.45673998  0.1153145  2.167043481
## I40  1.83730762  0.85722400 -0.59674628 -1.10307013  0.7639589 -0.007927584
## I41  1.96489842  0.12246057 -1.12955546 -1.36160220 -1.1819741  0.680621457
## I42  1.83730762 -0.97968458 -0.49018444 -0.19820791  0.1153145 -0.123005418
## I43 -0.45932690  0.48984229  0.36231024  0.18959018 -1.1819741  0.367993341
## I44  1.83730762 -0.61230286 -1.44924096 -1.49086823  2.0612476  1.321221400
## I45 -0.20414529  0.30615143 -0.38362261 -0.58600601  0.1153145  2.094160852
##          somers          srv     procian        acrg        acse     achplc
## I1   1.81134901 -0.235602209  1.27364523  2.05798499  2.22949975  1.4526665
## I2   0.40878227  0.339762329 -1.29886758 -1.69477063 -0.67508350 -1.3132720
## I3   0.11747995 -0.034041384 -0.58636403 -0.43868300 -0.85413316 -1.0910091
## I4  -0.20618930  0.376409752  0.80614290 -0.76433535 -1.29181008 -0.9428338
## I5   1.68188131  0.926121094  0.47864127 -0.60926280 -0.53582266 -1.1650967
## I6  -0.36802392 -0.001058703  0.19488986 -1.33810377 -1.59022617 -1.1897926
## I7   0.17142482 -0.444492519  0.40739092 -0.01998713 -0.29708979 -0.5230038
## I8  -0.36802392  1.197312023  0.28239029  0.95696991 -1.01328840 -0.5230038
## I9   0.82955229  1.754352850  2.51240140  0.61581031 -0.09814574  0.3660478
## I10 -0.43275777 -0.499463654  0.03113904 -1.57071259 -2.14726954 -1.6343184
## I11 -0.38960187 -0.132989425  0.12863953 -1.69477063 -1.92843107 -1.5108390
## I12 -0.60538137 -0.385856643 -0.15761190 -0.93491515 -1.35149330 -1.1650967
## I13 -0.54064752  0.310444391 -0.03636129 -1.15201671 -1.47085974 -1.4120555
## I14  0.52746100 -1.415649224 -0.23511228  1.62378186  1.25467386  1.2304036
## I15 -1.42534346 -0.953891697 -1.22886723 -0.34563947  0.04111511  1.1316201
## I16 -0.43275777  0.020929750 -0.48636353  0.01102738  0.27984798  0.7858778
## I17 -1.30666474 -0.796307778 -1.08636652 -1.47766906 -1.09286603 -0.8193544
```

```
## I18 -0.62695932 -0.514122623 -0.73386476  0.33667973  0.55836966  0.5883107
## I19 -0.99378447 -0.766989840 -1.10761662 -0.48520477 -0.11804014  0.2425684
## I20 -0.89668369 -0.964885923 -1.12261670 -0.26810320  0.06100951  0.1931767
## I21 -0.03356570 -0.165972106 -0.17636199  0.56928855  0.95625777  1.5761459
## I22 -0.20618930  0.112548307 -0.22136221 -0.17505967  0.24005916  0.5883107
## I23  0.20379175 -0.385856643 -0.09136157 -0.51621928 -0.15782895 -0.5230038
## I24 -0.70248214 -0.547105303 -0.91136565  0.30566522  0.22016476  0.7858778
## I25 -1.29587576 -1.217753141 -1.25511736 -1.07448044 -1.27191568 -0.8687461
## I26 -0.58380342 -0.081683034 -0.33636279  0.25914345  0.73741931  0.8352695
## I27 -0.48670265 -0.466480973 -0.25636239  0.86392638  1.09551861  1.4032747
## I28 -0.19540032 -0.792643036 -0.61636418 -0.08201615  0.27984798  0.6623984
## I29 -1.05851832 -0.873267366 -0.92386571  2.02697048  0.49868644  0.9093571
## I30 -0.95062857 -0.752330871  0.11988949  0.15059267  0.27984798  0.4154396
## I31 -0.51906957 -0.437163035 -0.59636408  0.55378129  0.47879203  0.9340530
## I32 -1.09088524 -0.986874377 -0.86136540 -0.33013222 -0.17772336 -0.1772615
## I33 -0.67011522 -0.818296232 -0.33261277  0.72436109  0.59815847  1.0081407
## I34 -1.51165526 -1.272724275 -1.08136649  0.07305640 -0.13793455  0.3413519
## I35  0.47351612 -0.583752726 -0.28511253 -1.35361102 -1.05307721 -1.9306689
## I36  1.11006564  1.604098416  0.77114273  0.53827404  0.43900322  0.5883107
## I37  0.43036022 -0.151313137  0.22614001 -0.73332084  0.57826406 -0.9922255
## I38  2.39395365  2.512954502  2.88365324 -0.14404516 -0.01856811 -0.7946585
## I39  2.17817416  1.758017592  2.20114985  0.41421600  0.27984798 -0.1772615
## I40 -0.01198775 -1.214088399 -0.48136351  0.01102738  0.14058713 -0.2266533
## I41  1.43373489  1.226629961  0.80864291  1.56175284  1.55308995  1.5020582
## I42  0.62456177  0.926121094  0.24364010 -0.37665398  0.25995357 -0.8193544
## I43  0.20379175  1.105693466  0.67239224  0.41421600  0.53847525  0.1931767
## I44  1.41215694  1.446514498  0.18363980  1.42218755  1.85150604  0.6377025
## I45  1.89766081  2.274746254  2.28115024  2.08899950  1.83161163  1.4279706
##             ic         ic2        tono         iim          eq1         vla
## I1   1.75341400  1.70293574 -0.05322959 -0.73752072  0.363254609 -1.7382623
## I2  -0.01475148 -0.01504638  0.30051138  0.11598991  0.290925151  3.8376299
## I3   0.37146897  0.38918471 -2.72144724  2.28259380  1.239244705  0.9700282
## I4  -0.15958414 -0.21716192 -0.50803942  2.21693914 -0.191271232 -0.4637726
## I5   1.25856905  1.15722377 -0.53836008  1.85583849  0.049826960  0.6514058
## I6  -0.55787397 -0.61634012 -0.09365713  2.49597146 -0.078758743 -0.3044614
## I7   1.62668541  1.64735397 -0.09365713  0.92025953  0.459693885 -1.2603286
## I8   0.75165472  0.77320424  0.14890811  0.78895021  0.982073300  1.2886506
## I9   1.02321597  1.14711800  2.06921626 -0.21228341  0.909743843 -0.6230838
## I10  0.35336489  0.32855004  0.24997696  1.21570552  1.970575886 -0.9417062
## I11  0.20853222  0.19212205  0.31061827  1.75735650  1.126732215 -0.4637726
## I12  0.57664858  0.54077137  0.45211466  0.44426322  1.367830407 -0.4637726
## I13  0.52233633  0.54077137  0.22976319  1.03515520  1.311574162  0.4920946
## I14  0.83614044  0.70246380 -0.43729123 -0.01531942 -0.263600689 -2.0568847
## I15 -1.78291695 -1.75324005  1.69526151 -0.08097409 -1.742336264  0.3327834
## I16 -0.73891481 -0.70223923  1.35162742 -0.26152441 -1.364615764  0.8107170
## I17 -1.63204959 -1.58649473  1.56387201 -0.36000641 -1.002968477  0.4920946
## I18 -0.51563111 -0.51022946 -0.51814631 -0.83600272 -0.496662275  0.3327834
## I19 -0.96219850 -0.92961921 -0.19472598 -0.98372571 -0.544881913  0.4920946
## I20 -0.55787397 -0.56581124 -0.60910827 -0.60621139 -0.585064945  0.1734722
## I21 -1.04668422 -1.03572987 -0.30590172 -0.01531942 -1.501238073  0.0141610
## I22 -1.37255772 -1.30858586  0.16912188 -0.37642007 -1.316396126  0.4920946
## I23  0.26284447  0.21738650 -0.93252859  0.52633155 -0.070722136 -0.4637726
## I24 -1.69843122 -1.64712939 -0.40697057 -0.52414306 -1.581604137  0.4920946
## I25 -0.87167809 -0.81845567 -0.86178040  0.29654023 -0.488625668 -0.1451502
```

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## I26 -1.09496178 -1.09131165 -0.08355025 -0.55697040 -1.364615764  0.3327834
## I27 -1.25789853 -1.28332142 -0.86178040 -0.11380142 -1.436945222 -0.4637726
## I28 -1.68032714 -1.69260539 -0.95274236 -0.27793808 -1.782519296 -0.4637726
## I29 -0.64839439 -0.64160456 -0.45750500 -0.80317538 -0.319856934 -0.1451502
## I30 -0.42511070 -0.38896014 -0.38675680 -0.95089838  0.210559087 -1.4196398
## I31  0.13611589  0.08095850 -1.18520072  0.32936756 -0.464515849  0.1734722
## I32 -0.27424334 -0.32832547 -1.20541449  0.19805824 -0.271637296 -0.4637726
## I33 -0.40700661 -0.48496502 -1.42776596 -0.01531942 -0.512735487 -0.9417062
## I34 -0.55787397 -0.62644590 -1.72086562 -0.13021508 -0.118941775 -0.6230838
## I35  0.26284447  0.24265094  0.49254220 -1.34482636  1.817880364 -0.6230838
## I36  0.51630164  0.53571848  2.06921626 -1.01655304  0.925817056  1.1293394
## I37  0.14818527  0.13654028  0.65425236 -1.42689469  0.885634024 -0.6230838
## I38  1.81376094  1.78883485  0.20954942 -0.27793808  1.488379503 -0.1451502
## I39  1.79565686  1.87978684  1.03831399 -1.11503504  1.448196471 -0.3044614
## I40 -0.29234742 -0.28284947  0.94735202 -0.70469339  0.001607321 -1.4196398
## I41  1.01114658  1.09153622  0.65425236 -0.93448471  0.459693885  0.4920946
## I42  0.05766486  0.04558828 -0.05322959 -0.75393439  0.009643928  0.9700282
## I43  0.68527308  0.62161758 -0.66974958  0.57557255 -0.376113179  0.6514058
## I44  1.30684661  1.40986820  1.37184119 -1.64027234  0.652572439  1.7665842
## I45  1.27063844  1.35428643  1.30109300  0.01750791 -0.094831955  0.1734722
##
## $nrows
## [1] 45
##
## $ncols
## [1] 18
##
## $nrowsSup
## [1] 0
##
## $ncolsSup
## [1] 0
##
## $dim
## [1] 3
##
## $EigenValues
##  [1] 277.12687550 199.36534193  85.42316719  61.02361652  54.61472549
##  [6]  33.21950770  23.10087611  18.20271969  12.93567822   8.99721387
## [11]   7.17039349   5.14634483   2.46693118   1.76863760   1.12884586
## [16]   0.26153511   0.02966717   0.01792254
##
## $Inertia
##  [1] 34.991 25.172 10.786  7.705  6.896  4.194  2.917  2.298  1.633  1.136
## [11]  0.905  0.650  0.311  0.223  0.143  0.033  0.004  0.002
##
## $CumInertia
##  [1] 34.991 60.163 70.949 78.654 85.550 89.744 92.661 94.959 96.592 97.728
## [11] 98.633 99.283 99.594 99.817 99.960 99.993 99.997 99.999
##
## $EV
##               [,1]        [,2]        [,3]
##  [1,] -0.269400471 -0.06678758  0.13502664
##  [2,] -0.179235894  0.09563188 -0.37266607
```

```
##  [3,] -0.089642289  0.34663991 -0.37767939
##  [4,] -0.025075364  0.37420670 -0.28461188
##  [5,]  0.075921760 -0.27872944 -0.13842752
##  [6,] -0.362771201 -0.04421297 -0.05176113
##  [7,] -0.366464498 -0.07220257 -0.06472232
##  [8,] -0.318130606 -0.04157401  0.19854164
##  [9,] -0.347804576 -0.04785685  0.02584725
## [10,] -0.120049408 -0.34086254 -0.31617278
## [11,] -0.084888000 -0.40207820 -0.26728099
## [12,]  0.047378644 -0.38977456 -0.25488092
## [13,] -0.368971746  0.05491570 -0.05287232
## [14,] -0.371435455  0.04476039 -0.03421019
## [15,] -0.139772430 -0.13640832  0.43913353
## [16,]  0.008178563  0.38035721 -0.12838425
## [17,] -0.274261123  0.19527349  0.18313281
## [18,]  0.002361018  0.03345360  0.26444673
##
## $Structure
##                Dim 1       Dim 2       Dim 3
## grado   -0.676100621 -0.14216550  0.18813991
## avol    -0.449819180  0.20356410 -0.51925579
## atot    -0.224970680  0.73786525 -0.52624112
## acfi    -0.062930361  0.79654453 -0.39656512
## ph       0.190536968 -0.59330955 -0.19287855
## folin   -0.910428381 -0.09411268 -0.07212159
## somers  -0.919697260 -0.15369195 -0.09018111
## srv     -0.798396155 -0.08849534  0.27663881
## procian -0.872867404 -0.10186913  0.03601437
## acrg    -0.301281876 -0.72556741 -0.44054064
## acse    -0.213039084 -0.85587240 -0.37241706
## achplc   0.118903766 -0.82968261 -0.35513937
## ic      -0.925989572  0.11689474 -0.07366987
## ic2     -0.932172617  0.09527794 -0.04766690
## tono    -0.350779739 -0.29036172  0.61186851
## iim      0.020525323  0.80963662 -0.17888472
## eq1     -0.688299153  0.41566340  0.25516885
## vla      0.005925326  0.07121006  0.36846793
##
## $RowCoordinates
##           Dim 1        Dim 2       Dim 3
## I1  -1.36579979 -0.542239684 -1.39822962
## I2  -0.03081654  1.072375293  0.29673422
## I3  -0.05043963  1.411728170 -0.80311878
## I4  -0.09953931  1.570703183 -0.55471758
## I5  -1.03717403  1.181536962 -0.68291045
## I6   0.25179390  1.276986747  0.21125141
## I7  -0.57234852  0.613650837 -0.37131585
## I8  -0.46552115  0.537699330  0.35079297
## I9  -1.23193433 -0.421254827  0.52090889
## I10 -0.19919952  1.254161081  0.54573376
## I11 -0.05179288  1.280448900  0.52315760
## I12  0.03030046  0.602565293  0.53670074
## I13 -0.14313013  0.835572065  0.60298197
## I14 -0.22095148 -0.509124841 -0.81208898
```

```
## I15  1.33430173 -0.506149077  0.32430035
## I16  0.66997864 -0.471438976  0.24836548
## I17  1.37231267  0.170617030  0.64966590
## I18  0.73969912 -0.518473211 -0.03567386
## I19  0.93230911 -0.292167087  0.32119827
## I20  0.88986875 -0.229493491  0.08912746
## I21  0.60722288 -0.384070077 -0.52515067
## I22  0.62702755 -0.575549506  0.02585170
## I23  0.09088214  0.098446456 -0.02837723
## I24  1.12426782 -0.525451947 -0.12047276
## I25  1.04064826  0.423785044  0.18224947
## I26  0.56492039 -0.655229566  0.12257373
## I27  0.71292927 -0.715833801 -0.40969989
## I28  0.98457008 -0.413045820 -0.23688842
## I29  0.51745353 -0.517327161 -0.65621839
## I30  0.47530834 -0.642531894  0.05558466
## I31  0.21346919 -0.083937995 -0.42118072
## I32  0.63662541  0.178553556 -0.16151661
## I33  0.50673108 -0.261268999 -0.48879606
## I34  1.02310243  0.008530425 -0.27859950
## I35 -0.52442667  0.715086916 -0.25138389
## I36 -1.00799599 -0.551428862  0.81832801
## I37 -0.20617881 -0.190566244  0.42521060
## I38 -2.00475153 -0.101757198  0.21450742
## I39 -1.75665661 -0.360085131  0.28851685
## I40  0.03345540 -0.422720496  0.09622424
## I41 -1.08771110 -0.982569880  0.19472609
## I42 -0.29852982 -0.162871972  0.53718014
## I43 -0.42549363  0.131019939 -0.24245651
## I44 -1.11004007 -1.363924129  0.49966378
## I45 -1.48874659 -0.962955354 -0.20273994
##
## $ColCoordinates
##               Dim 1      Dim 2       Dim 3
## grado   -0.79259397 -0.1964935  0.39725728
## avol    -0.52732383  0.2813553 -1.09640818
## atot    -0.26373353  1.0198375 -1.11115770
## acfi    -0.07377338  1.1009408 -0.83734693
## ph       0.22336683 -0.8200404 -0.40726289
## folin   -1.06729683 -0.1300775 -0.15228468
## somers  -1.07816275 -0.2124247 -0.19041735
## srv     -0.93596125 -0.1223135  0.58412263
## procian -1.02326403 -0.1407980  0.07604431
## acrg    -0.35319328 -1.0028401 -0.93020120
## acse    -0.24974610 -1.1829406 -0.78635831
## achplc   0.13939110 -1.1467425 -0.74987649
## ic      -1.08553924  0.1615656 -0.15555387
## ic2     -1.09278763  0.1316880 -0.10064862
## tono    -0.41121972 -0.4013223  1.29195985
## iim      0.02406187  1.1190360 -0.37771493
## eq1     -0.80689433  0.5745075  0.53878881
## vla      0.00694627  0.0984227  0.77801974
##
## $RowContributions
```

```
##     Dim 1 Dim 2 Dim 3
## I1  42.04  6.63 44.06
## I2   0.03 32.75  2.51
## I3   0.07 57.27 18.53
## I4   0.28 70.89  8.84
## I5  29.69 38.53 12.87
## I6   2.64 67.95  1.86
## I7  23.63 27.17  9.95
## I8  15.06 20.09  8.55
## I9  60.32  7.05 10.79
## I10  1.55 61.24 11.60
## I11  0.12 74.78 12.48
## I12  0.09 35.48 28.14
## I13  1.68 57.21 29.79
## I14  2.95 15.65 39.81
## I15 64.41  9.27  3.81
## I16 35.26 17.46  4.85
## I17 63.73  0.99 14.28
## I18 51.05 25.08  0.12
## I19 75.88  7.45  9.01
## I20 77.10  5.13  0.77
## I21 24.48  9.79 18.31
## I22 30.80 25.95  0.05
## I23  2.08  2.45  0.20
## I24 71.22 15.56  0.82
## I25 72.83 12.08  2.23
## I26 32.34 43.51  1.52
## I27 35.29 35.58 11.66
## I28 63.06 11.10  3.65
## I29 16.99 16.98 27.32
## I30 17.97 32.85  0.25
## I31  9.13  1.41 35.53
## I32 55.95  4.40  3.60
## I33 28.58  7.60 26.59
## I34 67.06  0.00  4.97
## I35  7.12 13.24  1.64
## I36 41.97 12.56 27.66
## I37  4.81  4.11 20.46
## I38 83.21  0.21  0.95
## I39 88.41  3.71  2.38
## I40  0.08 13.31  0.69
## I41 42.39 34.59  1.36
## I42  9.24  2.75 29.92
## I43 23.86  2.26  7.75
## I44 29.74 44.90  6.03
## I45 56.52 23.65  1.05
##
## $ColContributions
##         Dim 1 Dim 2 Dim 3
## grado   45.71  2.02  3.54
## avol    20.23  4.14 26.96
## atot     5.06 54.44 27.69
## acfi     0.40 63.45 15.73
## ph       3.63 35.20  3.72
```

```
## folin   82.89  0.89  0.52
## somers  84.58  2.36  0.81
## srv     63.74  0.78  7.65
## procian 76.19  1.04  0.13
## acrg     9.08 52.64 19.41
## acse     4.54 73.25 13.87
## achplc   1.41 68.84 12.61
## ic      85.75  1.37  0.54
## ic2     86.89  0.91  0.23
## tono    12.30  8.43 37.44
## iim      0.04 65.55  3.20
## eq1     47.38 17.28  6.51
## vla      0.00  0.51 13.58
##
## $Scale_Factor
## [1] 0.3398972
##
## $ClusterType
## [1] "us"
##
## $Clusters
##  [1] RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD86 RD87
## [16] RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87 RD87
## [31] RD87 RD87 RD87 RD87 T86  T86  T86  T86  T86  T86  T87  T87  T87  T87  T87
## Levels: RD86 RD87 T86 T87
##
## $ClusterColors
## [1] "red"     "#80FF00" "cyan"    "#8000FF"
##
## $ClusterNames
## [1] "RD86" "RD87" "T86"  "T87"
##
## attr(,"class")
## [1] "PCA.Analysis"
```

Grafico con poligonos CexInd= tamaÃ±o de los argumentos

```
acp4<-plot(acpvino1, PlotClus=TRUE,
           ClustCenters=TRUE, margin=0.05,
           CexInd=0.7, ShowBox=TRUE)
```

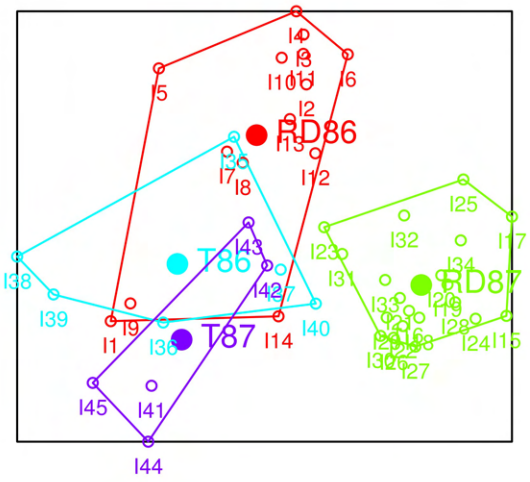


grafico con elipses

```
acp5<-plot(acpvino1, PlotClus=TRUE, ClustCenters=TRUE,
     margin=0.05, CexInd=0.7, TypeClus="el",
     ShowBox=F)
```

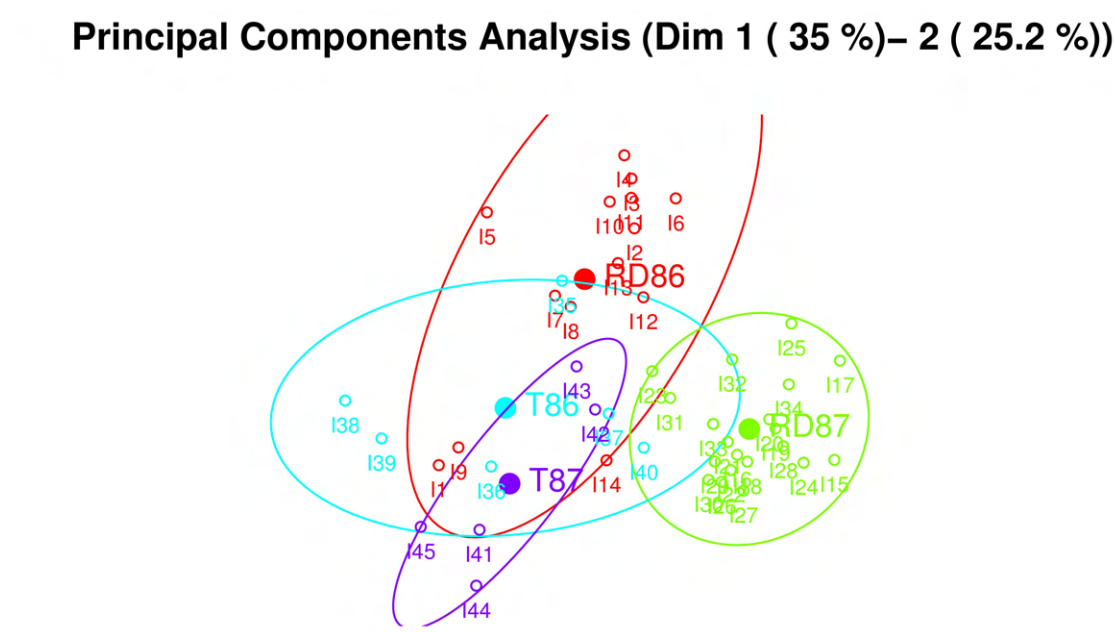
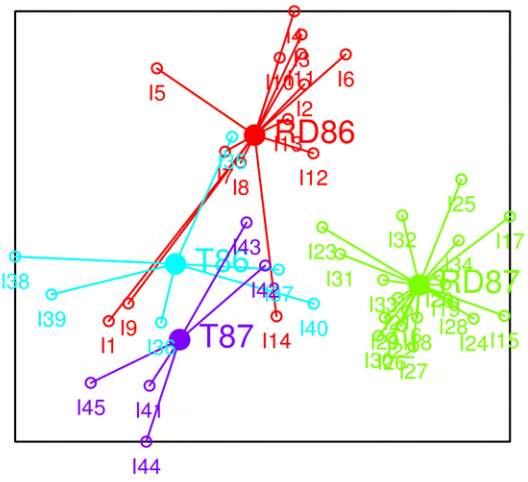


grafico con estrellas

```
acp6<-plot(acpvino1, PlotClus=TRUE, ClustCenters=TRUE,
     margin=0.05, CexInd=0.7, TypeClus="st",
     ShowBox=TRUE)
```



aqui se puede notar como las variables se junta en las figuras

Biplot

alpha= 0:GH 1:JK 2:HJ Predeterminado JK

```
bipvino<-PCA.Biplot(X, Scaling = 5)
summary(bipvino)
```

```
##  ###### Biplot for Principal Components Analysis #######
##
## Call
## PCA.Biplot(X = X, Scaling = 5)
## Type of coordinates:
## Transformation of the raw data:
## [1] "Standardize columns"
## Type of Biplot
## [1] "PCA"
##
##  Eigenvalues & Explained Variance (Inertia)
##      Eigenvalue Exp. Var Cummulative
## [1,]  277.12688   34.991      34.991
## [2,]  199.36534   25.172      60.163
## [3,]   85.42317   10.786      70.949
```

```
##
##
##  RELATIVE CONTRIBUTIONS OF THE FACTOR TO THE ELEMENT
##
##  Row Contributions
##      Dim 1 Dim 2 Dim 3
## I1   42.04  6.63 44.06
## I2    0.03 32.75  2.51
## I3    0.07 57.27 18.53
## I4    0.28 70.89  8.84
## I5   29.69 38.53 12.87
## I6    2.64 67.95  1.86
## I7   23.63 27.17  9.95
## I8   15.06 20.09  8.55
## I9   60.32  7.05 10.79
## I10   1.55 61.24 11.60
## I11   0.12 74.78 12.48
## I12   0.09 35.48 28.14
## I13   1.68 57.21 29.79
## I14   2.95 15.65 39.81
## I15 64.41  9.27  3.81
## I16 35.26 17.46  4.85
## I17 63.73  0.99 14.28
## I18 51.05 25.08  0.12
## I19 75.88  7.45  9.01
## I20 77.10  5.13  0.77
## I21 24.48  9.79 18.31
## I22 30.80 25.95  0.05
## I23  2.08  2.45  0.20
## I24 71.22 15.56  0.82
## I25 72.83 12.08  2.23
## I26 32.34 43.51  1.52
## I27 35.29 35.58 11.66
## I28 63.06 11.10  3.65
## I29 16.99 16.98 27.32
## I30 17.97 32.85  0.25
## I31  9.13  1.41 35.53
## I32 55.95  4.40  3.60
## I33 28.58  7.60 26.59
## I34 67.06  0.00  4.97
## I35  7.12 13.24  1.64
## I36 41.97 12.56 27.66
## I37  4.81  4.11 20.46
## I38 83.21  0.21  0.95
## I39 88.41  3.71  2.38
## I40  0.08 13.31  0.69
## I41 42.39 34.59  1.36
## I42  9.24  2.75 29.92
## I43 23.86  2.26  7.75
## I44 29.74 44.90  6.03
## I45 56.52 23.65  1.05
##
##  Column Contributions
##         Dim 1 Dim 2 Dim 3
```

```
## grado   45.71  2.02  3.54
## avol    20.23  4.14 26.96
## atot     5.06 54.44 27.69
## acfi     0.40 63.45 15.73
## ph       3.63 35.20  3.72
## folin   82.89  0.89  0.52
## somers  84.58  2.36  0.81
## srv     63.74  0.78  7.65
## procian 76.19  1.04  0.13
## acrg     9.08 52.64 19.41
## acse     4.54 73.25 13.87
## achplc   1.41 68.84 12.61
## ic      85.75  1.37  0.54
## ic2     86.89  0.91  0.23
## tono    12.30  8.43 37.44
## iim      0.04 65.55  3.20
## eq1     47.38 17.28  6.51
## vla      0.00  0.51 13.58
##
##
##
##  Qualities of representation of the rows (Cummulative contributions)
##     Dim 1 Dim 2 Dim 3
## I1  42.04 48.67 92.73
## I2   0.03 32.78 35.29
## I3   0.07 57.34 75.87
## I4   0.28 71.17 80.01
## I5  29.69 68.22 81.09
## I6   2.64 70.59 72.45
## I7  23.63 50.80 60.75
## I8  15.06 35.15 43.70
## I9  60.32 67.37 78.16
## I10  1.55 62.79 74.39
## I11  0.12 74.90 87.38
## I12  0.09 35.57 63.71
## I13  1.68 58.89 88.68
## I14  2.95 18.60 58.41
## I15 64.41 73.68 77.49
## I16 35.26 52.72 57.57
## I17 63.73 64.72 79.00
## I18 51.05 76.13 76.25
## I19 75.88 83.33 92.34
## I20 77.10 82.23 83.00
## I21 24.48 34.27 52.58
## I22 30.80 56.75 56.80
## I23  2.08  4.53  4.73
## I24 71.22 86.78 87.60
## I25 72.83 84.91 87.14
## I26 32.34 75.85 77.37
## I27 35.29 70.87 82.53
## I28 63.06 74.16 77.81
## I29 16.99 33.97 61.29
## I30 17.97 50.82 51.07
## I31  9.13 10.54 46.07
```

```
## I32 55.95 60.35 63.95
## I33 28.58 36.18 62.77
## I34 67.06 67.06 72.03
## I35  7.12 20.36 22.00
## I36 41.97 54.53 82.19
## I37  4.81  8.92 29.38
## I38 83.21 83.42 84.37
## I39 88.41 92.12 94.50
## I40  0.08 13.39 14.08
## I41 42.39 76.98 78.34
## I42  9.24 11.99 41.91
## I43 23.86 26.12 33.87
## I44 29.74 74.64 80.67
## I45 56.52 80.17 81.22
##
##
##
##  Qualities of representation of the columns (Cummulative contributions)
##         Dim 1 Dim 2 Dim 3
## grado   45.71 47.73 51.27
## avol    20.23 24.37 51.33
## atot     5.06 59.50 87.19
## acfi     0.40 63.85 79.58
## ph       3.63 38.83 42.55
## folin   82.89 83.78 84.30
## somers  84.58 86.94 87.75
## srv     63.74 64.52 72.17
## procian 76.19 77.23 77.36
## acrg     9.08 61.72 81.13
## acse     4.54 77.79 91.66
## achplc   1.41 70.25 82.86
## ic      85.75 87.12 87.66
## ic2     86.89 87.80 88.03
## tono    12.30 20.73 58.17
## iim      0.04 65.59 68.79
## eq1     47.38 64.66 71.17
## vla      0.00  0.51 14.09
```

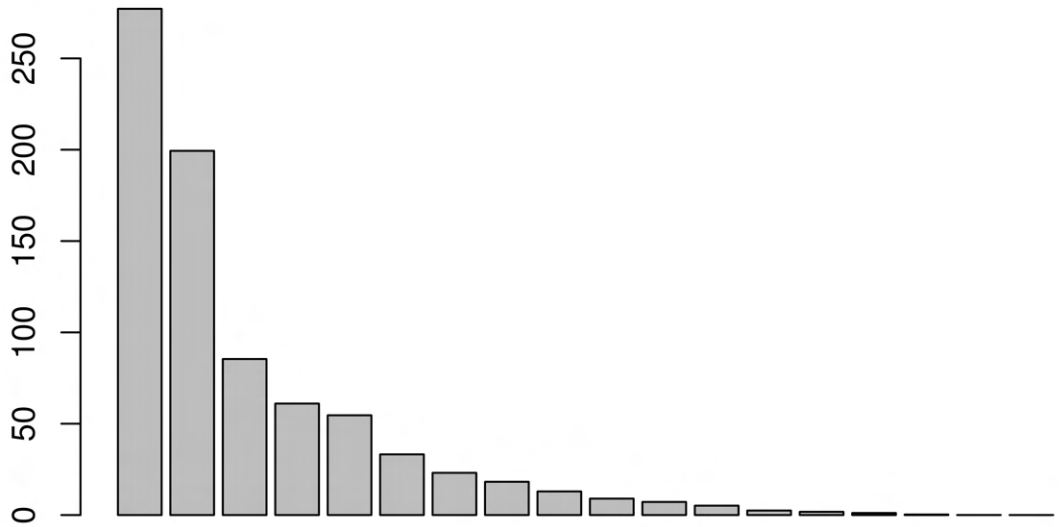
APORTES RELATIVOS DEL FACTOR AL ELEMENTO

Valores propios, screeplot, Vectores propios

```
bipvino$EigenValues
```

```
##  [1] 277.12687550 199.36534193  85.42316719  61.02361652  54.61472549
##  [6]  33.21950770  23.10087611  18.20271969  12.93567822   8.99721387
## [11]   7.17039349   5.14634483   2.46693118   1.76863760   1.12884586
## [16]   0.26153511   0.02966717   0.01792254
```

```
SC<-barplot(bipvino$EigenValues)
```




```
bipvino$EV
```

```
##               [,1]        [,2]        [,3]
##  [1,] -0.269400471 -0.06678758  0.13502664
##  [2,] -0.179235894  0.09563188 -0.37266607
##  [3,] -0.089642289  0.34663991 -0.37767939
##  [4,] -0.025075364  0.37420670 -0.28461188
##  [5,]  0.075921760 -0.27872944 -0.13842752
##  [6,] -0.362771201 -0.04421297 -0.05176113
##  [7,] -0.366464498 -0.07220257 -0.06472232
##  [8,] -0.318130606 -0.04157401  0.19854164
##  [9,] -0.347804576 -0.04785685  0.02584725
## [10,] -0.120049408 -0.34086254 -0.31617278
## [11,] -0.084888000 -0.40207820 -0.26728099
## [12,]  0.047378644 -0.38977456 -0.25488092
## [13,] -0.368971746  0.05491570 -0.05287232
## [14,] -0.371435455  0.04476039 -0.03421019
## [15,] -0.139772430 -0.13640832  0.43913353
## [16,]  0.008178563  0.38035721 -0.12838425
## [17,] -0.274261123  0.19527349  0.18313281
## [18,]  0.002361018  0.03345360  0.26444673
```

Tabla de inercias

```
Inercias<-data.frame(paste("Eje",1:length(bipvino$EigenValues)),
                     bipvino$EigenValues, bipvino$Inertia,
                     bipvino$CumInertia)

colnames(Inercias)<-c("Eje", "Valor Propio",
                     "Inercia", "Inercia acumulada")
```

Markdown

```
library(knitr)
kable(Inercias)
```

Eje	Valor Propio	Inercia	Inercia acumulada
Eje 1	277.1268755	34.991	34.991
Eje 2	199.3653419	25.172	60.163
Eje 3	85.4231672	10.786	70.949
Eje 4	61.0236165	7.705	78.654
Eje 5	54.6147255	6.896	85.550
Eje 6	33.2195077	4.194	89.744
Eje 7	23.1008761	2.917	92.661
Eje 8	18.2027197	2.298	94.959
Eje 9	12.9356782	1.633	96.592
Eje 10	8.9972139	1.136	97.728
Eje 11	7.1703935	0.905	98.633
Eje 12	5.1463448	0.650	99.283
Eje 13	2.4669312	0.311	99.594
Eje 14	1.7686376	0.223	99.817
Eje 15	1.1288459	0.143	99.960
Eje 16	0.2615351	0.033	99.993
Eje 17	0.0296672	0.004	99.997
Eje 18	0.0179225	0.002	99.999

podemos ver los valores propios y las inercias

tabla contribucion de columnas

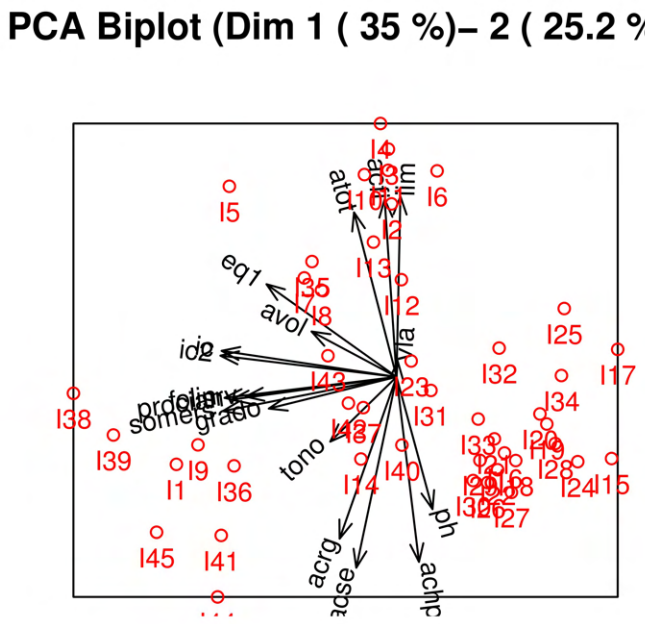
```
kable(bipvino$ColContributions)
```

	Dim 1	Dim 2	Dim 3
grado	45.71	2.02	3.54
avol	20.23	4.14	26.96
atot	5.06	54.44	27.69
acfi	0.40	63.45	15.73
ph	3.63	35.20	3.72

	Dim 1	Dim 2	Dim 3
folin	82.89	0.89	0.52
somers	84.58	2.36	0.81
srv	63.74	0.78	7.65
procian	76.19	1.04	0.13
acrg	9.08	52.64	19.41
acse	4.54	73.25	13.87
achplc	1.41	68.84	12.61
ic	85.75	1.37	0.54
ic2	86.89	0.91	0.23
tono	12.30	8.43	37.44
iim	0.04	65.55	3.20
eq1	47.38	17.28	6.51
vla	0.00	0.51	13.58

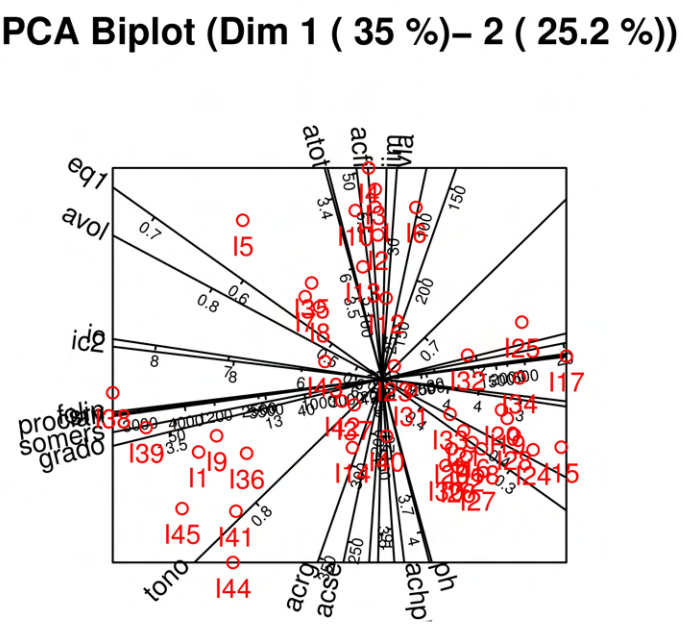
##Grafico

```
plot(bipvino, ShowBox=TRUE)
```



Prolongacion de vectores linea recta

```
BP1<-plot(bipvino, mode="s",
     margin=0.1, ShowBox=TRUE)
```



Prolongacion de vectores con flechas y linea punteada

```
BP2<-plot(bipvino, mode="ah", margin=0.05,
     ShowBox=TRUE)
```

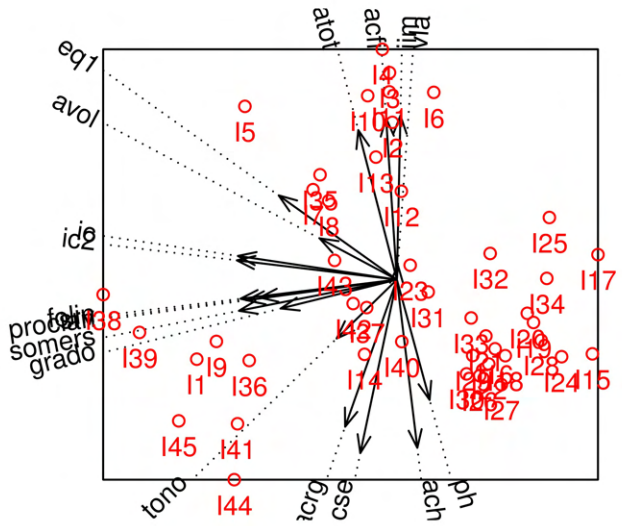


Grafico circular correlaciones

```
GC<-CorrelationCircle(bipvino)
```

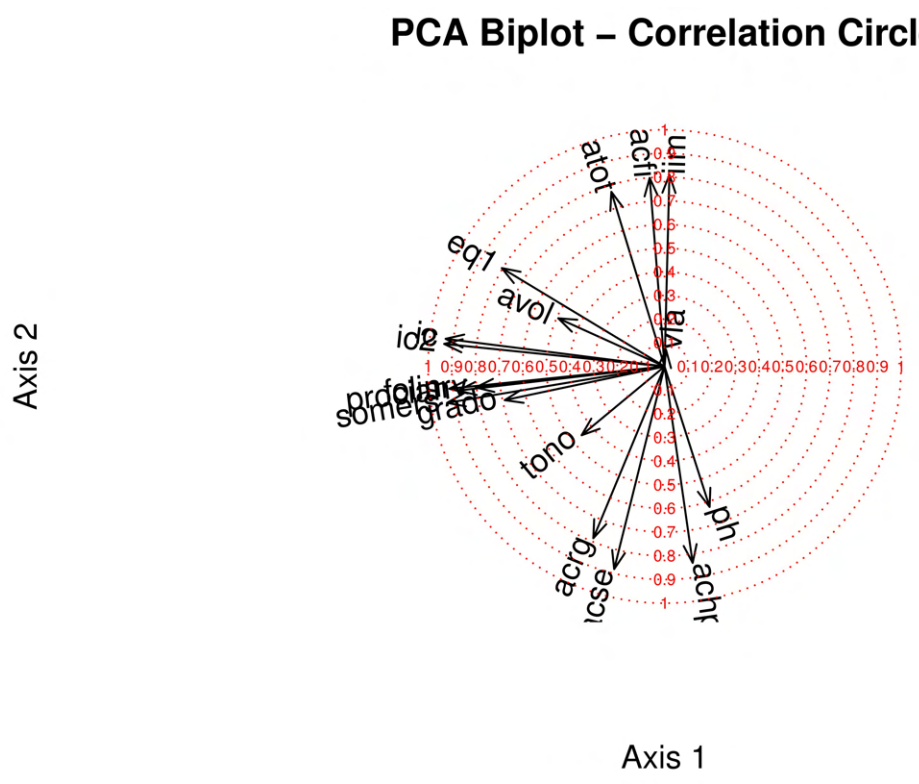
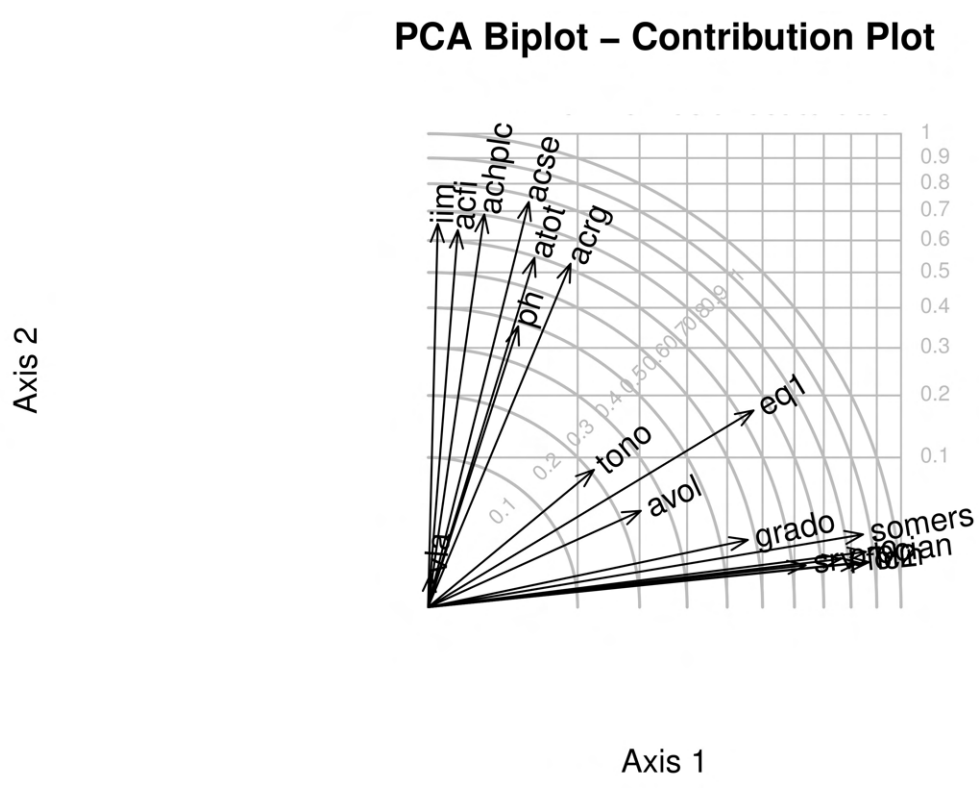


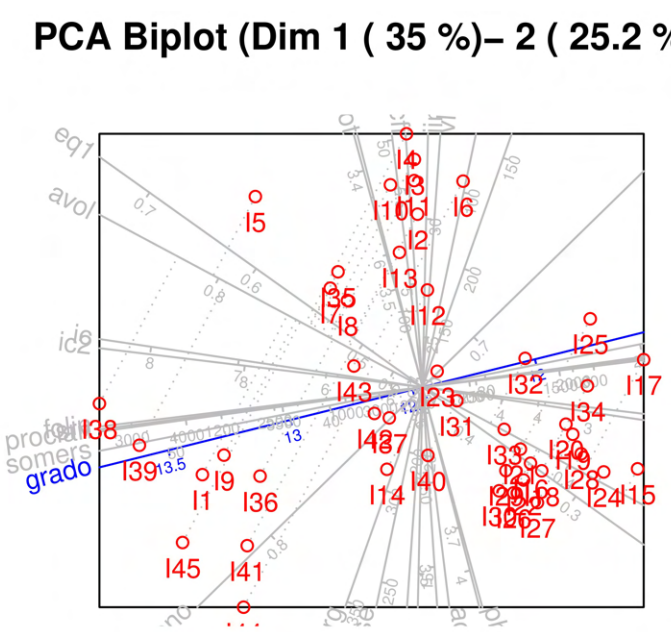
Grafico contribuciones de los vectores Calidad de representacion eje 1, 2 y 1+2

```
ColContributionPlot(bipvino, AddSigns2Labs = FALSE)
```



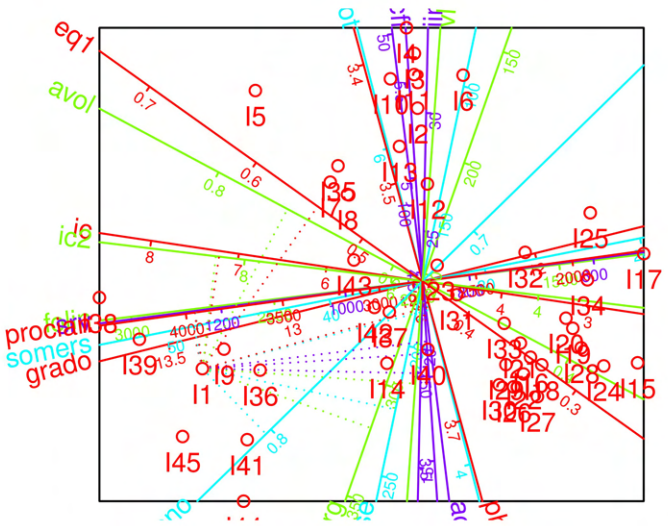
Proyeccion individuos sobre una variable dp= selecciona la variable

```
BP3<-plot(bipvino, dp=2, mode="s",
     ColorVar=c("blue", rep("grey",17)),
     ShowBox=TRUE)
```



##Proyeccion de ind sobre todas las variables PredPoints= individuo

```
BP4<-plot(bipvino, PredPoints=1, mode="s",
     ColorVar=1:18, ShowBox=TRUE)
```

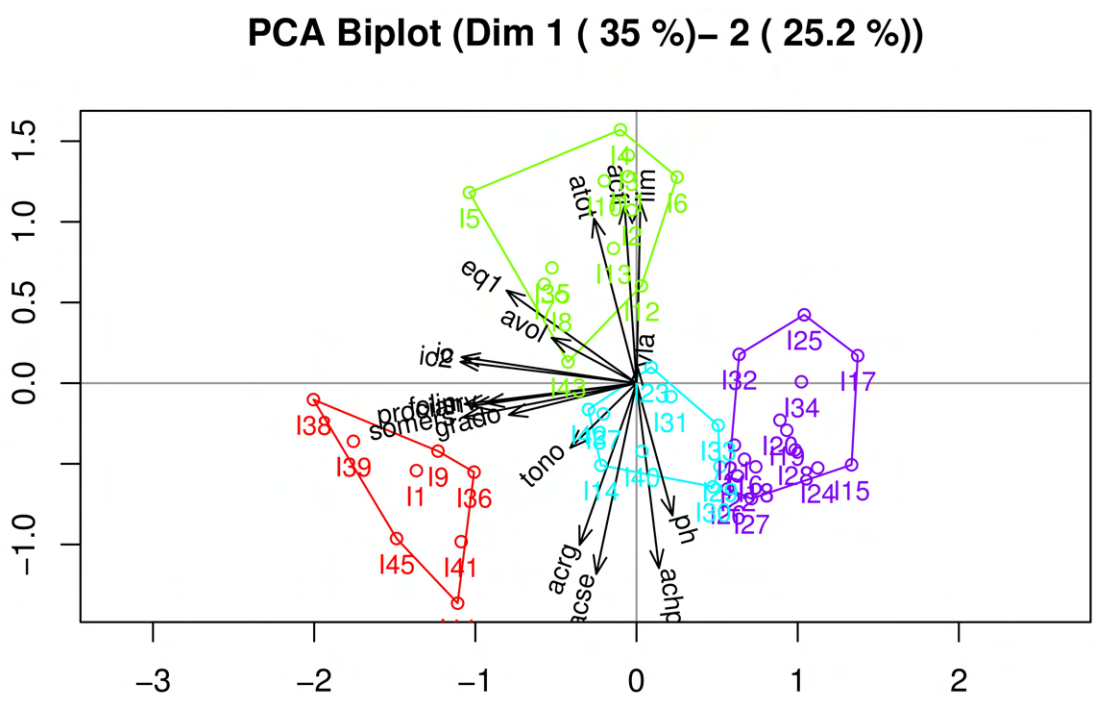


Agregar cluster Jerarquico con datos originales metodo ward.D

```
bipvino=AddCluster2Biplot(bipvino, NGroups=4,
                          ClusterType="hi",
                          method="ward.D",
                          Original=TRUE)
```

Cluster aplicado al biplot

```
clusBP<-plot(bipvino, PlotClus=TRUE,ShowAxis=TRUE)
```


PCA Biplot (Dim 1 (35 %)– 2 (25.2 %))
1.5
1.0
0.5
0.0
−1.0
−3
−2
−1
0
1
2
eq1
avol
tomo
acrg
acse
pH
I5
I6
I25
I32
I17
I34
I38
I39
I9
I1
I36
I45
I41
I24
I15
I27