ACC Analysis

Project Effect Fire Dung Beetle

David Vanegas-Alarcón

November 21, 2024

```r
ACCDB <- read.csv("DataACC.csv", header = T, sep = ";")

ID <- ACCDB[1]
```

Data Frame Summary

```r
dfSummary(ACCDB, plain.ascii = FALSE, style = "grid", graph.magnif = 0.75,
          valid.col = FALSE, tmp.img.dir  = "/tmp")
```

```
temporary images written to 'C:\tmp'
```

```
### Data Frame Summary
#### ACCDB
**Dimensions:** 15 x 18
**Duplicates:** 0

+----+-------------+---------------------------+--------------------+----------------------+---------+
| No | Variable    | Stats / Values            | Freqs (% of Valid) | Graph                | Missing |
+====+=============+===========================+====================+======================+=========+
| 1  | ID\         | 1\. 13\                   | 1 ( 6.7%)\         | ![](/tmp/ds0399.png) | 0\      |
|    | [character] | 2\. 14\                   | 1 ( 6.7%)\         |                      | (0.0%)  |
|    |             | 3\. 18\                   | 1 ( 6.7%)\         |                      |         |
|    |             | 4\. 2\                    | 1 ( 6.7%)\         |                      |         |
|    |             | 5\. 3\                    | 1 ( 6.7%)\         |                      |         |
|    |             | 6\. 6\                    | 1 ( 6.7%)\         |                      |         |
|    |             | 7\. 9\                    | 1 ( 6.7%)\         |                      |         |
|    |             | 8\. JTCP1\                | 1 ( 6.7%)\         |                      |         |
|    |             | 9\. S1.3b\                | 1 ( 6.7%)\         |                      |         |
|    |             | 10\. S3\                  | 1 ( 6.7%)\         |                      |         |
|    |             | [ 5 others ]              | 5 (33.3%)          |                      |         |
+----+-------------+---------------------------+--------------------+----------------------+---------+
| 2  | Cover\      | 1\. Biodiverse pasture\   | 5 (33.3%)\         | ![](/tmp/ds0400.png) | 0\      |
|    | [character] | 2\. Grass Monoculture\    | 5 (33.3%)\         |                      | (0.0%)  |
|    |             | 3\. Secondary Forest      | 5 (33.3%)          |                      |         |
+----+-------------+---------------------------+--------------------+----------------------+---------+
| 3  | FireRegime\ | 1\. High\                 | 5 (33.3%)\         | ![](/tmp/ds0401.png) | 0\      |
|    | [character] | 2\. Low\                  | 5 (33.3%)\         |                      | (0.0%)  |
|    |             | 3\. Null                  | 5 (33.3%)          |                      |         |
```

4	Abundance\ [integer]	Mean (sd) : 71 (48)\ min < med < max:\ 13 < 70 < 179\ IQR (CV) : 73.5 (0.7)	15 distinct values	`![](/tmp/ds0402.png)`	0\ (0.0%)
5	Richness\ [integer]	Mean (sd) : 7 (1.8)\ min < med < max:\ 4 < 7 < 10\ IQR (CV) : 2 (0.3)	4 : 1 (6.7%)\ 5 : 2 (13.3%)\ 6 : 4 (26.7%)\ 7 : 2 (13.3%)\ 8 : 3 (20.0%)\ 9 : 1 (6.7%)\ 10 : 2 (13.3%)	`![](/tmp/ds0403.png)`	0\ (0.0%)
6	q0\ [integer]	Mean (sd) : 7.1 (1.8)\ min < med < max:\ 4 < 7 < 10\ IQR (CV) : 2 (0.3)	4 : 1 (6.7%)\ 5 : 2 (13.3%)\ 6 : 4 (26.7%)\ 7 : 1 (6.7%)\ 8 : 4 (26.7%)\ 9 : 1 (6.7%)\ 10 : 2 (13.3%)	`![](/tmp/ds0404.png)`	0\ (0.0%)
7	q1\ [numeric]	Mean (sd) : 4.2 (1.2)\ min < med < max:\ 2.4 < 4.1 < 6\ IQR (CV) : 2 (0.3)	14 distinct values	`![](/tmp/ds0405.png)`	0\ (0.0%)
8	q2\ [numeric]	Mean (sd) : 3.3 (1.2)\ min < med < max:\ 1.7 < 3 < 5.1\ IQR (CV) : 1.9 (0.3)	14 distinct values	`![](/tmp/ds0406.png)`	0\ (0.0%)
9	pH\ [numeric]	Mean (sd) : 6 (0.3)\ min < med < max:\ 5.5 < 5.9 < 6.7\ IQR (CV) : 0.3 (0)	14 distinct values	`![](/tmp/ds0407.png)`	0\ (0.0%)
10	Humidity\ [numeric]	Mean (sd) : 29.9 (6.8)\ min < med < max:\ 20.8 < 28.7 < 43.3\ IQR (CV) : 8 (0.2)	15 distinct values	`![](/tmp/ds0408.png)`	0\ (0.0%)
11	DA\ [numeric]	Mean (sd) : 2 (0.1)\ min < med < max:\ 1.8 < 2.1 < 2.2\ IQR (CV) : 0.2 (0.1)	13 distinct values	`![](/tmp/ds0409.png)`	0\ (0.0%)
12	N\ [numeric]	Mean (sd) : 0.2 (0.1)\ min < med < max:\ 0 < 0.2 < 0.5\ IQR (CV) : 0.1 (0.7)	14 distinct values	`![](/tmp/ds0410.png)`	0\ (0.0%)
13	C\ [numeric]	Mean (sd) : 2.8 (1.4)\ min < med < max:\	15 distinct values	`![](/tmp/ds0411.png)`	0\ (0.0%)

```
|    |              | 1.2 < 2.5 < 5.9\         |                     |                      |          |
|    |              | IQR (CV) : 1.7 (0.5)     |                     |                      |          |
+----+--------------+--------------------------+---------------------+----------------------+----------+
| 14 | P_disp\      | Mean (sd) : 6.1 (9.5)\   | 14 distinct values  | ![](/tmp/ds0412.png) | 0\       |
|    | [numeric]    | min < med < max:\        |                     |                      | (0.0%)   |
|    |              | 0.7 < 2.8 < 34.8\        |                     |                      |          |
|    |              | IQR (CV) : 2.2 (1.5)     |                     |                      |          |
+----+--------------+--------------------------+---------------------+----------------------+----------+
| 15 | P_total\     | Mean (sd) : 306.9 (79.8)\ | 15 distinct values | ![](/tmp/ds0413.png) | 0\       |
|    | [numeric]    | min < med < max:\        |                     |                      | (0.0%)   |
|    |              | 156.7 < 304.4 < 447.9\   |                     |                      |          |
|    |              | IQR (CV) : 95.3 (0.3)    |                     |                      |          |
+----+--------------+--------------------------+---------------------+----------------------+----------+
| 16 | Arena\       | Mean (sd) : 37.7 (8.8)\  | 12 distinct values  | ![](/tmp/ds0414.png) | 0\       |
|    | [numeric]    | min < med < max:\        |                     |                      | (0.0%)   |
|    |              | 24.8 < 36.8 < 52.8\      |                     |                      |          |
|    |              | IQR (CV) : 10.5 (0.2)    |                     |                      |          |
+----+--------------+--------------------------+---------------------+----------------------+----------+
| 17 | Arcilla\     | Mean (sd) : 44.5 (8.9)\  | 12 distinct values  | ![](/tmp/ds0415.png) | 0\       |
|    | [numeric]    | min < med < max:\        |                     |                      | (0.0%)   |
|    |              | 30.2 < 45.2 < 61.2\      |                     |                      |          |
|    |              | IQR (CV) : 14.5 (0.2)    |                     |                      |          |
+----+--------------+--------------------------+---------------------+----------------------+----------+
| 18 | Limo\        | Mean (sd) : 17.8 (3.8)\  | 13 : 1 ( 6.7%)\     | ![](/tmp/ds0416.png) | 0\       |
|    | [integer]    | min < med < max:\        | 14 : 4 (26.7%)\     |                      | (0.0%)   |
|    |              | 13 < 17 < 24\            | 15 : 1 ( 6.7%)\     |                      |          |
|    |              | IQR (CV) : 6.5 (0.2)     | 17 : 2 (13.3%)\     |                      |          |
|    |              |                          | 19 : 2 (13.3%)\     |                      |          |
|    |              |                          | 20 : 1 ( 6.7%)\     |                      |          |
|    |              |                          | 21 : 1 ( 6.7%)\     |                      |          |
|    |              |                          | 22 : 1 ( 6.7%)\     |                      |          |
|    |              |                          | 24 : 2 (13.3%)      |                      |          |
+----+--------------+--------------------------+---------------------+----------------------+----------+
```

Analysis ACC

Obtenemos los valores de las correlaciones entre variables

Conocemos las variables de coprofagos a relacionar

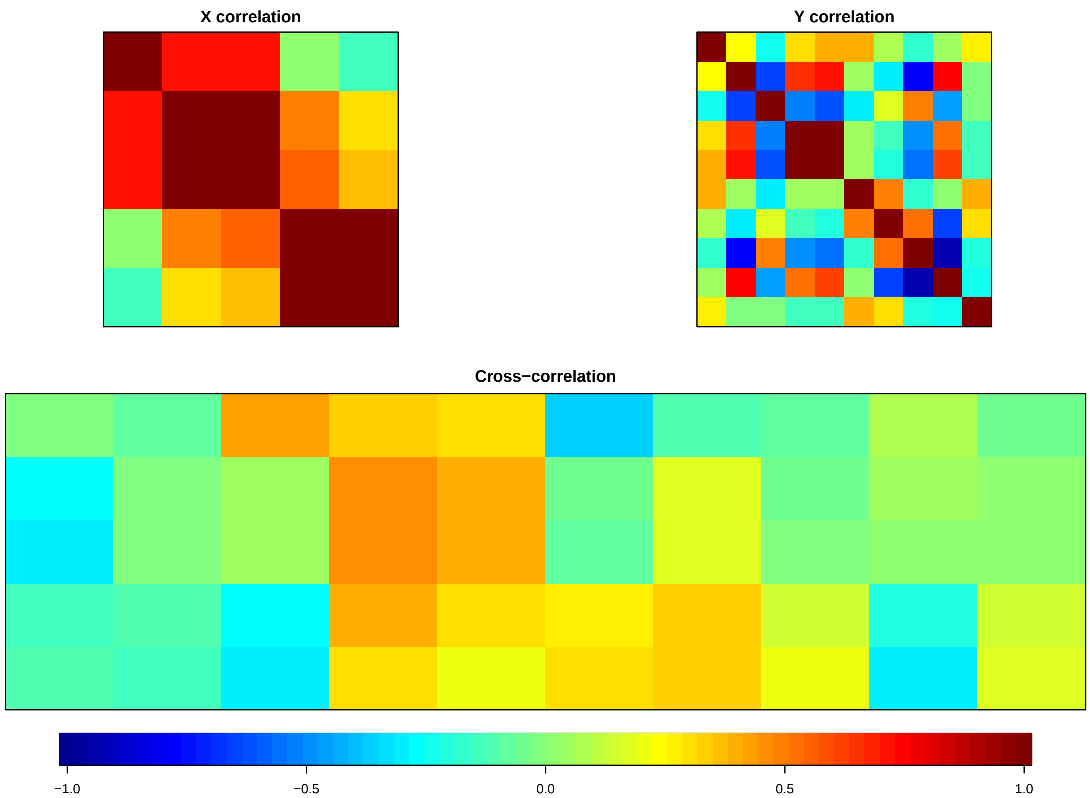
```r
names(ACCDB[, 4:8])
```

```
[1] "Abundance" "Richness"  "q0"        "q1"        "q2"
```

Conocemos las variables de suelo a relacionar

```r
names(ACCDB[, 9:18])
```

```
 [1] "pH"       "Humidity" "DA"       "N"        "C"        "P_disp"  
 [7] "P_total"  "Arena"    "Arcilla"  "Limo"
```



Calculamos las correlaciones canónicas.

```r
cc1 <- cc(dungbeetles, soil)
cc1$cor
```

```
[1] 0.9991714 0.9177246 0.7935859 0.6399311 0.3757272
```

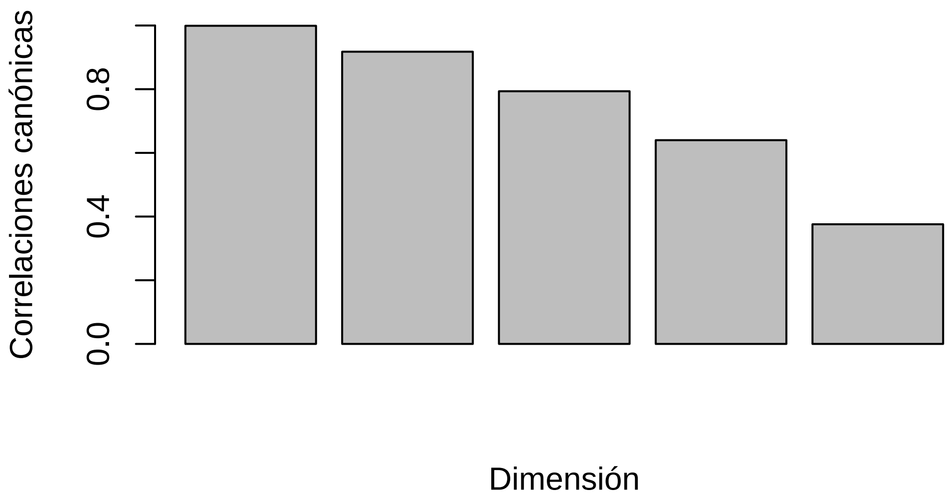
Calculamos los vectores canónicos

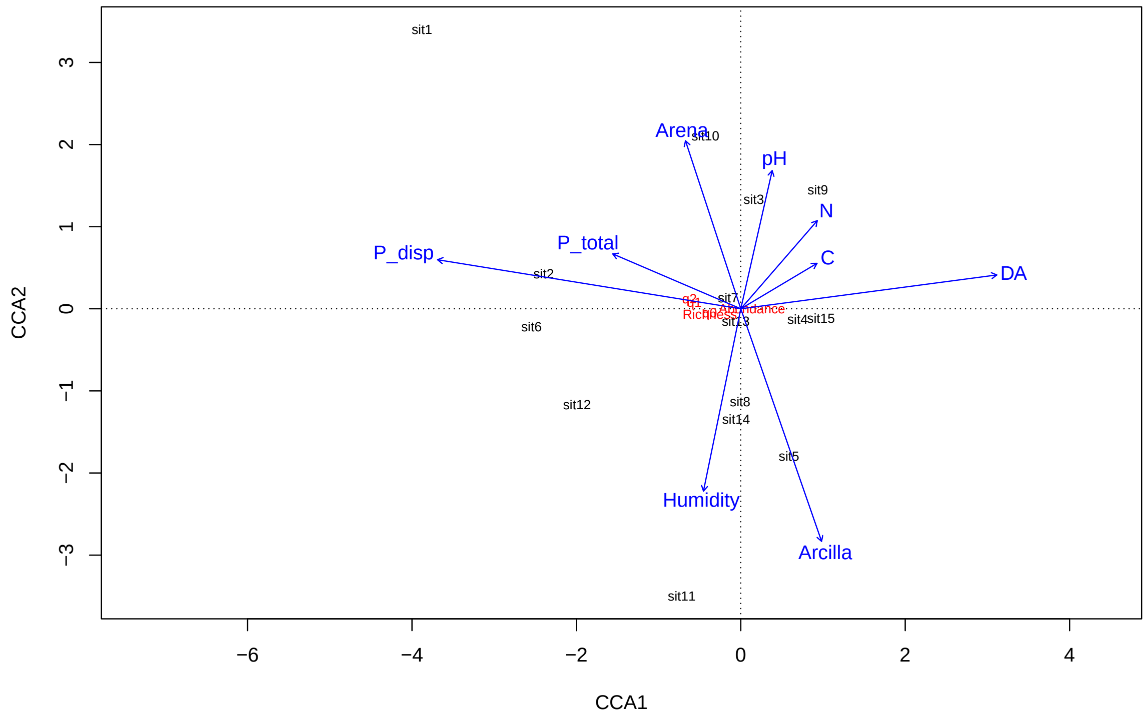
```r
cc1[3:4]
```

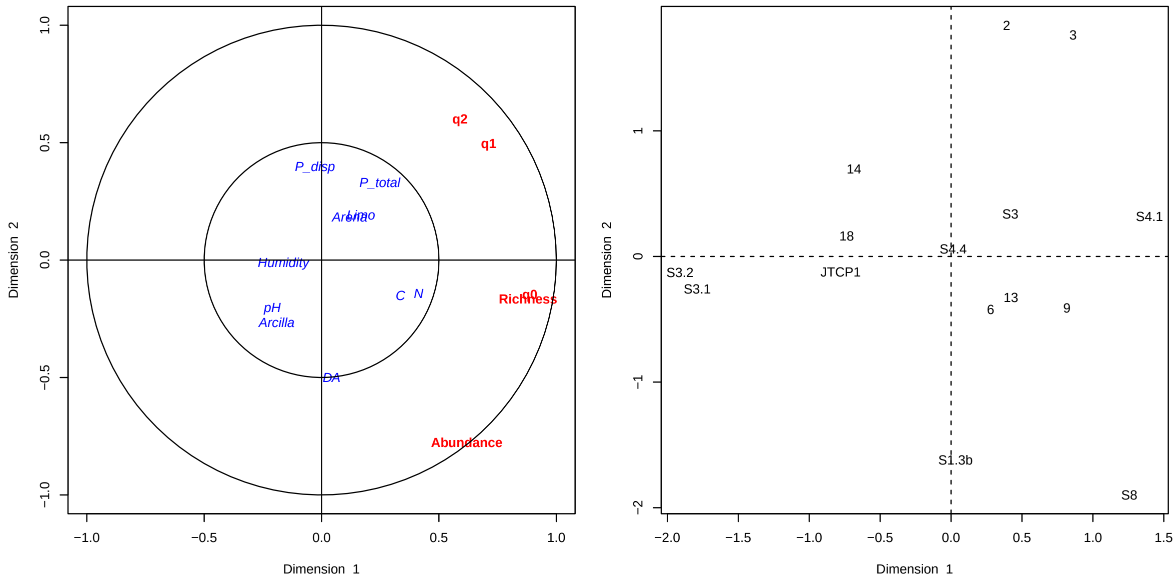
```
$xcoef
                  [,1]        [,2]        [,3]       [,4]         [,5]
Abundance  0.006272365 -0.02566235 -0.01636723 -0.0211524  0.003455225
Richness   0.699480607  0.37125319 -1.19936491 -1.0290469 -3.949423043
q0        -0.053908847  0.44016596  3.17233910  1.1690544  3.745015457
q1        -2.272684000 -2.91841159 -9.47006677  4.0408423  0.477779784
q2         2.642174667  2.99564029  8.27438012 -4.7142311 -0.458064794

$ycoef
                  [,1]         [,2]          [,3]         [,4]         [,5]
pH        -4.435709132 -1.653753573 -2.259058e+00 -1.670308549  2.054296921
Humidity  -0.058955136  0.061734637  4.506629e-04 -0.009833856 -0.097582393
```

```
DA          6.033541000 -6.253917331  1.795131e+00  0.015617629 -6.283923838
N         -22.936628986  4.648850573 -2.937635e+01 -5.352747436 46.890802493
C           3.648240062 -0.669148264  2.639224e+00  0.457785279 -5.111987653
P_disp      0.070893486  0.058256198 -5.690386e-02 -0.009732090 -0.107305961
P_total    -0.005923043 -0.004098261  5.496685e-03  0.012075794  0.008560338
Arena       0.104668435  0.060868829  1.985373e-02 -0.087900457 -0.117955005
Arcilla    -0.026390175 -0.047091599  2.232582e-02  0.048477598  0.031151203
Limo        0.204506469  0.040476187  1.301213e-01 -0.163761427 -0.122422052
```

```r
barplot(cc1$cor, xlab = "Dimensión", ylab = "Correlaciones canónicas", ylim = c(0, 1))
```




sit1
Arena
sit10
pH
sit9
sit3
N
C
DA
P_disp
P_total
sit2
sit7
q2
q1
q0
Abundance
Richness
sit13
sit4
sit15
sit6
sit12
sit8
sit14
sit5
Humidity
Arcilla
sit11
3
2
1
0
−1
−2
−3
−6
−4
−2
0
2
4
CCA1
CCA2



Prueba de dimensiones canónicas

```
rho  <-  cc1$cor

n  <-  dim(ACCDB)[1]
p  <-  length(dungbeetles)
q  <-  length(soil)

p.asym(rho, n, p, q, tstat ="Wilks")
```

```
Wilks' Lambda, using F-approximation (Rao's F):
                 stat    approx df1      df2   p.value
1 to 5:  4.907268e-05 0.5253122  50 3.364210 0.8653439
2 to 5:  2.962345e-02 0.2373145  36 5.484777 0.9967445
3 to 5:  1.877498e-01 0.2081070  24 6.401825 0.9979303
4 to 5:  5.071284e-01 0.1732453  14 6.000000 0.9966933
5 to 5:  8.588291e-01 0.1095840   6 4.000000 0.9899378
```