

# Phytosociological Study and Phytoecologique of Psammophytes of the Coastline of The Region of Tlemcen (Oranie-Algeria)

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## Abstract

This study is devoted to the analysis of psammophile of coastal dunes of the region of Tlemcen. The interpretation by the factor analysis of matches (A. F. C.) has allowed us to individualize classes' phytosociologique different. The colonize psammophile, par excellence, the embryonic dunes. Some species colonize the dunes vivid. Finally, other occupies the dunes the most advanced and laid down. Using the data and phytosociologique phytodynamiques, we were able to understand the evolution of this vegetation, and its diversity.

**Keywords:** Phytosociologie, psammophile, coastline, tlemcen, Algeria, diversity

## 1. Introduction

The vegetation, the region of Tlemcen, presents a good example of study of plant diversity; and especially an interesting synthesis on the natural dynamics of ecosystems from the shoreline up to the steppe. This study has been launched by several authors. These include mainly: Zeraïa (1981), Dahmani-Megrouche (1997), Quezel (2000), and Bouazza and Benabadji (1998).

The ecosystems Mediterranean coastlines are characterized by climatic constraints and strong soil, salinity, wind, drought and shallow soils or mobile.

The work that we are presenting here concerns the evolution of psammophiles the coastline of the region of Tlemcen. The latter is linked to a high percentage of sand, always higher than 60 %. Although they are located in the northern part; in the South, these formations are well represented and are essentially related to the importance of deposits of sand and the presence of gypsum and salts.

This study has been carried out on the basis of the readings phytosociologiques to determine the narrow affinities of different plant groups. In the second place, the knowledge of this floristic richness allows you to make proposals leading to the preservation and improvement of these fragile environments, to limit the degradation and to promote their development in a rational way.

## 2. Materials and Methods

The study covers the analysis of the distribution of species in the the coastal region of Tlemcen: study sites were chosen. From the beach Beni Saf up Marsat Ben M'hidi.

For this we chose two areas repartees as follows:

- Representative areas them live dunes and dune embryonic (from the beach Beni-Saf up to Marsat Ben M'hidi).
- Zones representing the semi-fixed dunes (Ghazaouet cement factory station (Beni-Saf).

The study area is characterized by a high floristic diversity which is related to the combination of ecological factors that are also very varied (variation bioclimatic, Action anthropozoogène).

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For this study it was selected 10 stations to study locating in the western part of the North West Algeria Figure.1. These are located between  $1^{\circ}27'$  and  $1^{\circ}51'$  west longitude and  $34^{\circ}27'$  and  $35^{\circ}18'$  north latitude. They are geographically limited:

- to the North by the Mediterranean sea
- to the south by the wilaya of Na'imah
- to the west by the moroccan-algerian border
- to the east by the wilaya of Temouchent
- to the south-east by the wilaya of Sidi Bel Abbas



Figure 1. Location of Studies Stations

### 2.1 Béni Saf

Those lands are limestone lithothamniées rich in fossil shells lumachellique of type post- tablecloths Miocene. rest on these limestones intercalations clays to sandstone Tortonian age (Miocene). The limestones constitute a plateau called "Sidi Safi plateau" from which is calcium carbonate noted for cement plant Beni Saf. These limestones are covered with places by volcanic formations of type basaltic, Guardia (1975).

### 2.2 Rachgoune

The station is located at the mouth of Tafna. These are the dune deposits at "El Guedim" and, on the right bank of the Oued, in these dunes appear basalt flows black color inter stratified with the volcanic tuffs, Guardia (1975).

### 2.3 Genesis of Sea Dunes

Under the effect of erosion, sand particles are going to move grace to winds to feed the dune ridge of coastline.

### 2.4 Dunes

The wind pushes the sand which will hang on waste brought by the sea. This forms a hump get bigger and bigger. This is the birth of a dune where embryonic going to develop a ephemeral vegetation based on: *Medicago marina*; *Cakile maritima*; *Euphorbia paralias*. According to Favennec (2002), dune is a deposition of sand edified by the wind into coming up against various obstacles such as vegetation and asperities terrain encountered between the beach and the mainland.

The dynamics of dunes depends on the one hand of the Wind speed and the dimension of sand particles and, on the other hand, obstacles which are the vegetation or the reliefs. As a function of the latter we distinguish 04 kinds of dunes.

- **The high dunes:** encountered the vicinity of the sea (beach Rachgoune, Beidar, Egla M'Khaled).
- **Dunes on slopes:** are on slopes exposed to the sea (the valleys Rachgoune).
- **Suspended dunes:** are formed on the cliffs parallel to neighborhood of the sea (Ouled Ayad).
- **Dunes clad:** depots constitutes tackles against of the scree of slope. It is characterized by the vegetation based : *Crucianella maritima*, *Thymelaea hirsuta* and *Elichrysum stoechas*. (Marsat Ben M'hidi)

The bioclimatic study for two periods (1913-1938) and (1970-2002). Figure 2 showed a vertical indent of each station in direct relation with the Q2 Emberger. Station Ghazaouet, despite falling on of the value of Q2 always under floor lower semi-arid to hot winter.

This climate favors the extension of vegetation therophytic xerophytes.

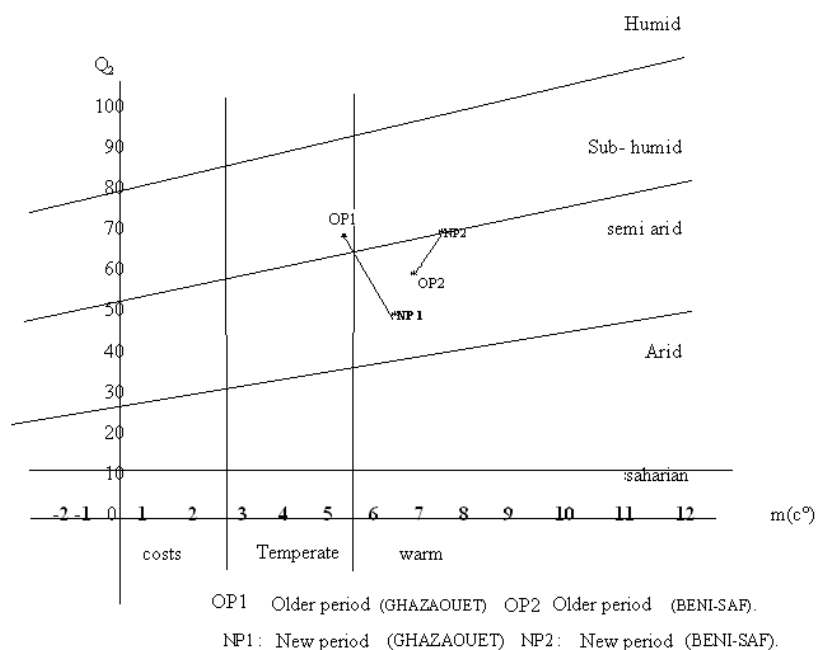


Figure 2. Temperature and humidity within them different zones

### 3. Results and Discussion (of the species from the beach)

This analysis focused on 98 surveys in the beach and shoreline (inside). It subdivided the processing of data in two part that corresponds:

- 41 records in the beach
- 57 records indoors (coastal)

|                     |        |        |        |
|---------------------|--------|--------|--------|
| Plan                | 1      | 2      | 3      |
| Rate of inertia     | 5,5330 | 3,8675 | 3,2664 |
| <b>Eigen values</b> | 0,138  | 0,097  | 0,082  |

Examination of factorial maps showing the plans of 2/1 and 3/1 projections shows the existence of 04 contrasting sets we will thus attempt to specify what will be the major ecological factors in the diversification of the sward.

#### 3.1 Plan 2/1:

The negative side: *Lobularia maritima*, *Chenopodium album*, *Eryngium maritimum*, *Asteriscus maritimus*, *Calycotome spinosa*, *Chamaerops humilis*, *Chenopodium album*, *Hedysarum sp*, *Juniperus phoenicea*

The positive side: *Centaurium unbellatum*, *Cladanthus arabicus*, *Juniperus oxycedrus*, *Paronychia argentea*, *Rhamnus lycioides*, *Scabiosa stellata*, *Spartium junceum*, *Trifolium stellatum*

This axis is indifferent to substrate species and independence vis à vis the water factor.

### 3.2 Plan 3/1:

The negative side: *Gnaphalium luteo-album*, *Lagurus ovatus*, *Plantago marina*, *Quercus coccifera*, *Silene maritima*, *Spartium junceum*, *Ulex parviflorus*

The positive side: *Centaurium unbellatum*, *Cistus monspeliensis*, *Cistus salvifolius*, *Erica multiflora*, *Phagnalon saxatile*, *Trifolium stellatum*

The positive side of this axis lies in particular species characterizing locations silica, and the negative side revealing a less silica than the first pole.

It seems that this group of species in their vast majority is plants that are most commonly seen in the littoral on siliceous substrate to Cisto-Lavanduletea.

In the center of the axis lie in particular a lot of species of *Cakile maritima*, *Ammophila arenaria*, *Calystegia soldanella*, *Echinophora spinosa*, *Medicago minima*, *Medicago marina*

These species of psammophytes quintessential (purely psammophilous) that grow on the dunes a strong accumulation Sandy periods of respite from erosion marine; This is a group that is found on the beach of Rechgoune and Marsat Ben M'hidi at an elevation of 0 m on a low slope of zero and with a very low rate of recovery.

As it moves away from the beach, ecological conditions (Climate, soil) take up the top, and allow the installation of annuals and same perennial basis from: *Cynodon dactylon*, *Silene pseudo-atocion*, *Lobularia maritima*, *Teucrium pollium*, *Matthiola sinuate*, *Silene conica*, *Lagurus ovatus*, *Elichrysum stoechas*.

The behavior of species diversity and vegetation stresses the importance of the stability of the substrate for vegetation and already show that the coast is highly structured depending on the distance to the sea. The before dune and dune pioneer are influenced by a strong dynamic of sand and have a low plant collection, as well as a monotonous flora. Greater stability of the sand allows the species to cover larger areas and encourages. Furthermore, the coexistence of most abundant species.

It appears therefore that A.F.C was able to reveal the classic data of the littoral vegetation as described in 1923 by Kuhnholz-Lordat. In phytosociological terms, maritime dunes belonging to the Ammophilion alliance, characterized by *Cakile maritima*, *Eryngium maritimum* et *Calystegia soldanella*.

Vegetation there forms a complex of plant associations arranged parallel to the shore (Figure 3) and richly described by Molinier and Tallon (1965).

The **Agropyretum-mediterraneum** is the typical association forming the belt at the base of the dunes (zone 1). Its characteristic species are all observed in (zone 1), we have: *Agropyrum junceum*, *Polygonum maritimum* et *Cyperus aegyptiacus*.

**Ammophiletum arundinaceae** is the typical of the growing dune (zone 2 and 3). It is characterized by: *Ammophila arenaria*, *Medicago marina* et *Echinophora spinosa*. Enfin, le **Crucianelletum** settled on the dunes consolidated (area 4 and 5) and is typically: *Crucianella maritima*, *Medicago littoralis* et *Pancreatium maritimum*.

The indications of the analysis of vegetation carried out in this study support this vision, but should not consider these associations and their characteristic species too strictly. Indeed, the analyses presented here also highlight the ongoing nature of the changes in vegetation.

Nude beach (zone 0) there is no vegetation. This area is in fact continually swept by waves that do not allow no plant to set. The sand is so naked up to the larger amplitude wave zone. Furthermore, as the present low amplitude tides Mediterranean, this portion of the beach is never covered by water and does not allow a particular fauna to settle. Apart from his recent tourist interest and the fact that it represents the pulling of the constitutive sand dunes area, this portion of the Mediterranean beach is low biological interest.

Table 1. Them floristic surveys of the beach and Valleys of Rachgoune

| Station: valleys of Rachgoune. Beach and Siga |                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| exposition : north-South                      |                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Recovery : 60-70%                             |                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| altitude (m)                                  |                | 172 | 180 | 205 | 204 | 214 | 206 | 190 | 209 | 212 | 160 | 185 | 180 | 210 | 200 | 160 |
| GENRES SPECIES                                | Survey         | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
| <i>Ammophila arenaria (L.) Link.</i>          | Poacées        |     |     |     |     |     |     |     |     |     | +   |     |     |     |     |     |
| <i>Anagalis arvensis L.</i>                   | Primulacées    | 0   | 0   | +   | +   |     |     |     |     | +   |     | +   |     |     |     |     |
| <i>Asperula hirsuta L.</i>                    | Rutacées       | 0   | 0   | +   | +   | 1   | 1   |     |     |     |     |     | +   | +   |     |     |
| <i>Asphodelus microcarpus Salzm et Viv.</i>   | Liliacées      | 0   | 0   | 0   | +   |     |     |     |     |     |     |     |     |     |     |     |
| <i>Avena sterilis L.</i>                      | Poacées        | 0   | 0   | 0   | +   |     |     |     |     |     |     | +   |     |     |     |     |
| <i>Bromus rubens L.</i>                       | Poacées        |     |     |     |     |     |     |     |     |     |     | +   |     |     |     |     |
| <i>Cakile maritima Scop.</i>                  | Brassicacées   |     |     |     |     |     |     |     |     |     | 1   |     |     |     |     |     |
| <i>Calendula arvensis L.</i>                  | Astéracées     | 3   | 0   |     |     |     |     |     |     |     |     |     |     |     |     | +   |
| <i>Calycotome spinosa (L.) Link.</i>          | Fabacées       | 2   | 2   | 1   | +   | 1   | 1   |     |     |     |     |     |     |     |     |     |
| <i>Calystegia soldanella L.</i>               | Convolvulacées |     |     |     |     |     |     |     |     |     | 1   |     |     |     |     |     |
| <i>Centaureum umbellatum (Gibb). Beck.</i>    | Gentianacées   | +   | 1   | 2   | +   | +   |     | +   |     |     |     |     |     |     |     |     |
| <i>Chamaerops humilis L.</i>                  | Palmacées      | 0   | 0   | 0   | 1   |     |     |     |     |     |     |     |     |     |     |     |
| <i>Chrysanthemum grandiflorum (L.) Batt.</i>  | Astéracées     |     |     |     |     |     |     |     |     | +   | +   | +   |     |     |     |     |
| <i>Chrysanthemum coronarium L.</i>            | Astéracées     |     |     |     |     |     |     |     |     |     |     | +   |     |     |     |     |
| <i>Cistus monspeliensis L.</i>                | Cistacées      | 2   | 2   | 3   | 4   | 3   | 4   | +   | 3   | 3   | 2   |     | 1   | 2   |     | 1   |
| <i>Cistus salvifolius L.</i>                  | Cistacées      | 2   | 2   | 2   | 2   |     | +   | 1   |     |     |     |     |     |     |     |     |
| <i>Cladanthus arabicus (L.) Cass.</i>         | Astéracées     | 2   | 2   | 3   | 4   |     | 2   | +   | +   |     |     | 3   | 1   | 2   |     | 3   |
| <i>Cuscuta sp (Tourn.) L.</i>                 | Cuscutacées    |     |     |     |     |     |     |     |     |     |     |     |     |     |     | +   |
| <i>Dactylis glomerata L.</i>                  | Poacées        | 1   | 0   |     | +   | +   |     |     |     |     |     |     |     |     |     |     |
| <i>Daucus carota L.</i>                       | Apiacées       | 2   | 0   | 2   | +   | 1   |     |     |     |     |     |     |     |     |     |     |
| <i>Daucus carota subsp gummifer Lamk.</i>     | Apiacées       |     |     |     |     |     |     |     |     | 1   | +   |     |     |     |     |     |
| <i>Echinops spinosus L.</i>                   | Apiacées       |     |     |     |     |     |     |     |     | 1   | +   |     |     |     | +   |     |
| <i>Echinophora spinosa L.</i>                 | Apiacées       |     |     |     |     |     |     |     |     |     | 1   |     | +   |     |     |     |
| <i>Echium vulgare Tourn.</i>                  | Borraginacées  | 3   | 0   |     | +   |     | +   |     |     |     |     |     |     | +   | +   |     |
| <i>Ephedra fragilis Desf.</i>                 | Ephedracées    |     |     |     |     |     |     |     |     | 1   | +   |     |     |     |     |     |
| <i>Erica multiflora L.</i>                    | Ericacées      | 1   | 1   | 1   | 2   | 2   |     |     |     | 1   | +   |     |     |     |     |     |
| <i>Euphorbia paralias L.</i>                  | Euphorbiacées  |     |     |     |     |     |     |     |     | 1   | 1   | 1   |     |     |     |     |
| <i>Euphorbia peplis L.</i>                    | Euphorbiacées  | 0   | 0   | 0   | +   |     |     |     |     |     |     |     |     |     |     |     |
| <i>Fagonia cretica L.</i>                     | Zygophyllacées | 3   | 0   |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Gla diolus segetum Ker-Gawl.</i>           | Iridacées      |     |     |     |     |     |     |     |     | +   |     |     |     |     |     |     |
| <i>Globularia alypum L.</i>                   | Globulariacées | 2   | 0   |     |     | +   |     |     |     |     |     |     |     |     |     |     |
| <i>Gnaphalium luteo-album L.</i>              | Astéracées     | 0   | 0   | 0   | 0   | +   |     |     | 1   |     |     | +   |     |     |     | 1   |
| <i>Hedysarum sp L.</i>                        | Fabacées       | 2   | 1   |     | 2   |     |     | +   | +   |     |     |     |     |     |     | 3   |
| <i>Inula crithmoides L.</i>                   | Astéracées     |     |     | +   |     |     |     |     | +   |     |     |     |     |     |     |     |
| <i>Juncus maritimus Lamk.</i>                 | Juncacées      |     |     |     |     |     |     |     |     | 1   | +   |     |     |     |     | 2   |
| <i>Juniperus oxycedrus L.</i>                 | Cupressacées   | 4   | 3   | 4   | 4   | 4   | 4   | 4   | 4   | 3   | 4   |     |     |     |     | 4   |
| <i>Juniperus phoenicea L.</i>                 | Cupressacées   | 0   | 0   | +   | 1   |     | +   |     |     |     |     | 2   |     |     |     | 2   |
| <i>Lagurus ovatus L.</i>                      | Poacées        | 2   | 0   |     |     |     |     |     |     |     |     | 1   |     |     |     | 1   |
| <i>Limonium sinuatum (L.) Mill.</i>           | Linacées       | 0   | 0   | 0   | 0   | 0   | 0   | +   |     |     |     |     |     |     |     |     |

|   |                 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|-----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <i>Linum strictum L.</i>                  | Linacées        | 3 | 0 |   |   |   |   | + | + | 1 | 1 |   |   |   |   |
| <i>Lygeum spartum L.</i>                  | Poacées         |   |   |   |   |   |   |   |   |   |   | 1 |   |   |   |
| <i>Marrubium vulgare L.</i>               | Lamiacées       | 0 | 0 | 0 | 0 | 0 | + | + |   |   |   | + | 4 |   |   |
| <i>Medicago marina L.</i>                 | Fabacées        | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | + | 3 |   |
| <i>Medicago minima Grufb.</i>             | Fabacées        | 0 | 0 | 0 | 0 | 0 | 0 | 0 | + | 1 |   |   |   |   |   |
| <i>Medicago littoralis Rhode.</i>         | Fabacées        |   |   |   |   |   |   |   |   | 1 |   |   |   |   |   |
| <i>Mesembryanthemum nodiflorum L.</i>     | Aizoacées       | 0 | 0 | 0 | + |   |   |   |   |   |   |   |   |   |   |
| <i>Muscari comosum (L.) Mill.</i>         | Liliacées       | 0 | 0 | 0 | 0 | 0 | 0 | 0 | + |   |   |   |   |   |   |
| <i>Myrtus communis M.</i>                 | Myrtacées       | 0 | + |   |   |   |   | + | + | + |   |   |   |   |   |
| <i>Olea europaea L.</i>                   | Oléacées        | 0 | 0 | 0 | 0 | 0 | 0 | + | + |   |   |   |   |   |   |
| <i>Ononis spinosa L.</i>                  | Fabacées        | + | 0 |   |   |   |   |   |   |   |   |   | 3 |   |   |
| <i>Ononis natrix L.</i>                   | Fabacées        | 0 | 0 | 0 | 0 | + |   |   |   | + | 1 |   | + | 1 |   |
| <i>Paronychia argentea (Pourr.) Lamk.</i> | Caryophyllacées | 2 | 0 | 1 | + |   |   |   |   |   |   |   |   | + |   |
| <i>Phagnalon saxatile (L.) Cass.</i>      | Astéracées      | 2 | 2 | 3 | 3 | 2 | 3 | + |   | + | 2 |   |   |   |   |
| <i>Phragmites communis</i>                | Poacées         |   |   |   |   |   |   |   |   |   | + | + |   | + |   |
| <i>Pinus halepensis L.</i>                | Pinacées        | 1 | 0 |   |   |   |   |   |   |   |   |   | 1 |   |   |
| <i>Pinus maritima L.</i>                  | Pinacées        | 2 | 0 | 3 | 1 |   | 1 | 4 | 2 | 2 | 1 |   |   | 1 |   |
| <i>Pistacia lentiscus L.</i>              | Oléacées        | 0 | 0 | + | + | + |   |   |   |   |   |   |   |   |   |
| <i>Plantago argentea Desf.</i>            | Plantaginacées  | 3 | 0 |   |   |   |   |   |   |   |   | 1 |   |   |   |
| <i>Plantago lagopus L.</i>                | Plantaginacées  |   |   |   |   |   |   |   |   |   | + | 1 |   | + | 1 |
| <i>Plantago marina L.</i>                 | Plantaginacées  | 0 | 2 | 2 |   |   |   | + |   |   |   | 1 |   |   |   |
| <i>Plantago psyllium L.</i>               | Fabacées        | 0 | 1 | 2 |   |   |   | + |   |   |   |   |   |   |   |
| <i>Quercus coccifera L.</i>               | Fagacées        | 3 | 2 | 2 |   |   |   |   |   |   |   | 3 |   |   |   |
| <i>Raphanus raphanistrum L.</i>           | Brassicacées    | 0 | 0 | 0 | + |   |   |   |   |   |   |   |   |   |   |
| <i>Reichardia tingitana (L.) Roth.</i>    | Astéracées      | 0 | 0 | 0 | + |   |   |   |   |   |   |   |   |   |   |
| <i>Rhamnus alaternus L.</i>               | Rhamnacées      | 0 | 0 | 0 | 0 | 0 | 1 |   |   | 1 | + |   |   | + |   |
| <i>Rhamnus lycioides L.</i>               | Rhamnacées      | 1 | 1 |   |   | 1 | + |   |   | 1 | 1 |   |   |   |   |
| <i>Rosmarinus officinalis L.</i>          | Lamiacées       |   |   |   |   |   |   |   |   | 1 | + |   |   |   |   |
| <i>Rubia peregrina L.</i>                 | Rubiacees       |   |   |   |   |   |   |   |   |   |   |   |   | 1 |   |
| <i>Rubia sp L.</i>                        | Rubiacees       | 0 | 0 | 4 | 4 |   |   | + |   |   |   |   |   |   |   |
| <i>Salicornia ramosissima L.</i>          | Chénopodiacées  |   |   |   |   |   |   |   |   |   | + | + |   |   |   |
| <i>Scabiosa stellata L.</i>               | Dipsacacées     | 2 | 1 | 3 | 2 | 1 | + |   | 2 | + | 2 |   |   | + |   |
| <i>Scorpiurus vermiculatus L.</i>         | Fabacées        |   |   |   |   |   |   |   |   | 1 | + |   |   |   |   |
| <i>Senecio leucanthemifolius Poiret.</i>  | Astéracées      |   |   |   | + |   |   |   |   |   |   | + | + |   |   |
| <i>Silene coeli-rosa (L.) A. Br.</i>      | Caryophyllacées |   |   |   | + |   |   |   |   |   |   | 2 |   | 2 | 1 |
| <i>Silene maritima L.</i>                 | Caryophyllacées | 2 | 2 |   |   | 2 |   |   |   |   |   |   |   |   |   |
| <i>Spartium junceum L.</i>                | Fabacées        | + | 1 | 3 | 4 | 3 | 3 |   |   | 1 | 2 |   |   |   |   |
| <i>Teucrium fruticans L.</i>              | Lamiacées       | 0 | 1 |   |   |   |   |   |   |   | + | 1 |   |   |   |
| <i>Teucrium polium L.</i>                 | Lamiacées       |   |   |   |   |   |   |   |   |   | + | 1 | + |   |   |
| <i>Thymus ciliatus Desf.</i>              | Lamiacées       |   |   |   |   |   |   |   |   | 1 | + | + |   | 3 |   |
| <i>Trifolium stellatum L.</i>             | Fabacées        | 0 | 1 | 0 | + | 1 |   | + |   | + | 1 |   |   | + |   |
| <i>Ulex parviflorus Pourret.</i>          | Fabacées        | 0 | 0 | 0 | 1 |   |   | + |   |   |   |   |   | + |   |

Table 2. Them floristic surveys of beach of Ouled Ben Ayad ( Ghazaouet)

| Station : Ouled Ben Ayed                     |                 | 185 | 16 | 40 | 20 |
|--|-----------------|-----|----|----|----|
| exposition : north east                      |                 |     |    |    |    |
| Covering rates : 40-50%                      |                 |     |    |    |    |
| Substrate : silicious                        |                 |     |    |    |    |
| Altitude (m)                                 |                 | 185 | 16 | 40 | 20 |
| GENRES SPECIES                               | Survey          | 1   | 2  | 3  | 4  |
| <i>Alopecurus pratensis</i> L.               | Poacées         | +   |    | +  |    |
| <i>Arenaria emarginata</i> Brot.             | Caryophyllacées | +   |    | +  | +  |
| <i>Asteriscus maritimus</i> (L.) Less.       | Astéracées      | 1   | +  | +  | +  |
| <i>Atriplex halimus</i> L.                   | Chénopodiacées  | +   |    |    | +  |
| <i>Avena sterilis</i> L.                     | Poacées         | +   |    | +  | +  |
| <i>Bromus madritensis</i> L.                 | Poacées         | 1   |    | +  | 1  |
| <i>Bromus rubens</i> L.                      | Poacées         | +   |    |    | 1  |
| <i>Cakile maritima</i> Scop.                 | Brassicacées    | +   |    | +  | +  |
| <i>Centaurea pullata</i> L.                  | Astéracées      | +   | +  | +  | +  |
| <i>Chrysanthemum grandiflorum</i> (L.) Batt. | Astéracées      | 1   | 1  | +  | +  |
| <i>Dactylis glomerata</i> L.                 | Poacées         | 1   |    | +  | 1  |
| <i>Erodium moschatum</i> L.                  | Géraniacées     | +   | +  | +  | +  |
| <i>Frankenia laevigata</i> L.                | Frankeniacees   | +   | +  | +  | +  |
| <i>Gnaphalium luteo-album</i> L.             | Astéracées      | +   |    | +  | +  |
| <i>Hedysarum sp</i> L.                       | Fabacées        | 1   | 1  | 1  | +  |
| <i>Hippocrepis multisiliquosa</i> L.         | Brassicacées    | +   |    | +  | +  |
| <i>Hordeum murinum</i> Witth.                | Poacées         | 1   | 1  | +  | +  |
| <i>Inula crithmoides</i> L.                  | Astéracées      | +   |    | +  | +  |
| <i>Lagurus ovatus</i> L.                     | Poacées         | 1   | 1  | 1  | +  |
| <i>Lavatera maritima</i> Gouan.              | Malvacées       | 1   | 1  | +  | +  |
| <i>Lobularia maritima</i> (L.) Desv.         | Brassicacées    | +   |    | +  | +  |
| <i>Lolium rigidum</i> Gaud.                  | Poacées         | +   |    | +  | 1  |
| <i>Lotus ornithopoides</i> L.                | Fabacées        | +   |    | +  | +  |
| <i>Malva sylvestris</i> L.                   | Malvacées       | +   |    | +  | +  |
| <i>Matthiola sinuata</i> (L.) R. Br.         | Fabacées        | 1   | +  |    | +  |
| <i>Medicago marina</i> L.                    | Fabacées        | +   | 1  | 1  | +  |
| <i>Medicago littoralis</i> Rhode.            | Fabacées        | +   | +  | +  | +  |
| <i>Medicago minima</i> Grufb.                | Fabacées        | +   |    | +  |    |
| <i>Oxalis pes-caprae</i> L.                  | Oxalidacées     | +   |    | +  | +  |
| <i>Orchis purpurea</i> L.                    | Orchidacées     | +   | +  |    | +  |
| <i>Ononis natrix</i> L.                      | Fabacées        |     | 1  | +  |    |
| <i>Paronychia argentea</i> (Pourr.) Lamk.    | Caryophyllacées |     | +  |    | +  |
| <i>Phagnalon saxatile</i> (L.) Cass.         | Astéracées      | +   |    | +  | +  |
| <i>Plantago lagopus</i> L.                   | Plantaginacées  | +   | +  |    | +  |
| <i>Plantago marina</i> L.                    | Plantaginacées  | +   |    | +  | +  |
| <i>Plantago psyllium</i> L.                  | Plantaginacées  | +   | 1  |    | +  |
| <i>Raphanus raphanistrum</i> L.              | Brassicacées    | 1   | 1  | 1  | +  |
| <i>Reichardia tingitana</i> (L.) Roth.       | Astéracées      | +   |    | +  | +  |
| <i>Senecio leucanthemifolius</i> Poiret.     | Astéracées      | +   |    | +  | +  |
| <i>Silene maritima</i> L.                    | Caryophyllacées | +   |    | +  | +  |
| <i>Suaeda maritima</i> (L.) Dumort.          | Chénopodiacées  | +   | +  |    | +  |
| <i>Trifolium angustifolium</i> L.            | Fabacées        | +   |    |    | +  |
| <i>Trifolium stellatum</i> L.                | Fabacées        | +   |    | +  |    |

Table 3. Them floristic surveys of beach of Beni Saf; Sidi Boucif and Sid Safi

| Station : beach of Beni Saf                  |                 | Station : beach of Sidi Boucif |     |     |     |     |     |     |     |     |     |     |     | Station : beach of Sidi Safi |     |     |     |     |     |     |     |
|--|-----------------|--------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Exposition : North                           |                 | exposition : North             |     |     |     |     |     |     |     |     |     |     |     | Exposition : North           |     |     |     |     |     |     |     |
| Covering rates: 05-10%                       |                 | Covering rates : 20-25%        |     |     |     |     |     |     |     |     |     |     |     | Covering rates : 10-20%      |     |     |     |     |     |     |     |
| Altitude (m)                                 |                 | 190                            | 209 | 212 | 160 | 191 | 191 | 200 | 200 | 210 | 210 | 210 | 200 | 200                          | 271 | 273 | 270 | 260 | 215 | 202 | 180 |
| GENRES SPECIES                               | Survey          | 1                              | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13                           | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
| <i>Andropogon hirtus L.</i>                  | Poacées         | +                              |     | +   | 1   |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Anagallis arvensis L.</i>                 | Primulacées     |                                |     |     |     |     |     |     |     |     |     |     |     |                              |     | +   |     | +   |     |     | +   |
| <i>Arenaria emarginata Brot.</i>             | Caryophyllacées | 1                              | +   |     | 1   | 1   |     | +   | +   | 1   | 1   | +   | +   | +                            |     |     |     |     |     |     |     |
| <i>Asparagus stipularis Forsk.</i>           | Liliacées       | 1                              |     | +   | 1   | 1   | 1   | +   |     | +   | +   |     | +   |                              |     |     |     |     |     |     |     |
| <i>Asteriscus maritimus (L.) Less.</i>       | Astéracées      |                                |     |     |     |     | +   | +   | +   | +   | +   |     | +   | +                            | 1   | +   | 1   | 1   |     | 1   | +   |
| <i>Atractylis concellata L.</i>              | Astéracées      | +                              |     |     |     |     |     |     |     |     |     |     |     |                              |     | +   |     |     |     |     |     |
| <i>Atractylis pycnocephalus L.</i>           | Astéracées      | +                              |     |     |     |     |     |     |     |     |     |     |     |                              |     | +   |     |     |     |     |     |
| <i>Atriplex halimus L.</i>                   | Chénopodiacées  |                                |     |     | +   |     |     |     |     |     |     |     |     |                              |     |     |     | +   |     |     |     |
| <i>Avena sterilis L.</i>                     | Poacées         |                                |     |     |     | +   |     |     |     |     | +   |     | +   |                              |     |     |     |     |     |     |     |
| <i>Bellis annua L.</i>                       | Astéracées      |                                |     |     |     | +   | +   | +   | +   | +   | +   |     |     |                              |     |     |     |     |     |     |     |
| <i>Bupleurum protractum Hoffm . et Link.</i> | Apiacées        | 1                              |     | 1   | +   |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Bromus rubens L.</i>                      | Poacées         |                                |     |     |     | +   |     |     |     |     | +   |     |     |                              |     |     |     | 1   |     |     |     |
| <i>Calycotome spinosa (L.) Link.</i>         | Fabacées        | +                              |     | +   |     |     |     |     |     |     |     |     |     |                              |     | +   |     |     |     |     |     |
| <i>Calystegia soldanella L.</i>              | Astéracées      | 1                              |     | +   | +   |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Catananche coerulea L.</i>                | Astéracées      | 1                              | +   |     | +   | +   | +   | +   | +   | +   | +   | +   | +   | +                            |     |     |     |     |     |     |     |
| <i>Centaurea pullata L.</i>                  | Gentianacées    |                                |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     | +   |
| <i>Chamaerops humilis L.</i>                 | Chénopodiacées  | +                              |     | +   | 1   |     |     |     |     |     |     |     |     |                              | 3   | +   |     |     |     | +   | 1   |
| <i>Chenopodium album L.</i>                  | Astéracées      |                                |     |     |     |     |     |     |     |     |     |     |     |                              | +   |     |     |     |     |     |     |
| <i>Chrysanthemum grandiflorum (L.) Batt.</i> | Astéracées      |                                |     |     |     |     |     |     |     |     |     |     |     |                              | +   |     |     |     |     |     |     |
| <i>Chrysanthemum coronarium L.</i>           | Cistacées       | +                              |     | 1   |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     | +   |
| <i>Cuscuta sp (Tourn.) L.</i>                | Cuscutacées     |                                |     |     |     |     |     | +   |     |     |     |     |     |                              |     |     |     |     |     |     | +   |
| <i>Dactylis glomerata L.</i>                 | Poacées         |                                |     |     |     | +   | +   | +   |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Daucus carota subsp gummiifer Lamk.</i>   | Apiacées        | 1                              |     | 1   | +   |     |     |     |     |     |     |     |     |                              | +   | 1   |     | 2   | 1   |     | 1   |
| <i>Delphinium peregrinum L.</i>              | Renonculacées   |                                |     |     |     |     |     |     |     |     |     |     |     |                              | +   |     | +   |     |     |     |     |
| <i>Echinophora spinosa L.</i>                | Apiacées        | 1                              |     | +   | +   |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Echium vulgare Tourn.</i>                 | Borraginacées   |                                |     |     |     |     |     |     |     |     |     |     |     |                              |     |     | 1   |     |     |     |     |
| <i>Ephedra fragilis Desf.</i>                | Ephedracées     |                                |     |     |     |     |     |     |     |     |     |     |     |                              | +   | 1   |     |     |     |     |     |
| <i>Erica arborea L.</i>                      | Ericacées       | +                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Erica multiflora L.</i>                   | Ericacées       | 1                              | +   |     | +   | 1   | +   |     | +   | +   |     |     | +   | +                            |     |     |     |     |     |     |     |
| <i>Erodium moschatum (Burm) L'Her.</i>       | Géraniacées     |                                |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Eryngium tricuspdatum L.</i>              | Apiacées        |                                |     |     |     | +   |     | +   | +   | +   |     | +   | +   | +                            |     |     |     |     |     |     |     |
| <i>Eryngium maritimum L.</i>                 | Apiacées        |                                |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     | 1   |
| <i>Fagonia cretica L.</i>                    | Zygophyllacées  |                                |     |     |     |     |     |     |     |     |     |     |     |                              | +   |     |     |     |     |     |     |
| <i>Globularia alypum L.</i>                  | Globulariacées  |                                |     |     |     |     |     |     |     |     |     |     |     |                              | 2   | +   |     | 3   | +   | 1   | 1   |
| <i>Gnaphalium luteo-album L.</i>             | Astéracées      |                                |     |     |     | +   |     | +   | +   | +   | +   |     | +   | +                            |     |     |     |     |     |     |     |
| <i>Halimium halimifolium (L.) Willk.</i>     | Cistacées       |                                |     |     |     |     |     |     |     |     |     |     |     |                              | 1   |     |     |     | 1   | 1   | +   |
| <i>Hedysarum sp L.</i>                       | Fabacées        | 2                              | 3   | 1   | +   |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     | +   |
| <i>Hordeum murinum With.</i>                 | Poacées         |                                |     |     |     | +   |     |     |     | +   |     |     |     |                              |     |     |     |     |     |     |     |
| <i>Inula crithmoides L.</i>                  | Astéracées      |                                |     | 1   |     |     |     |     |     |     |     |     |     |                              | +   |     |     |     |     |     |     |





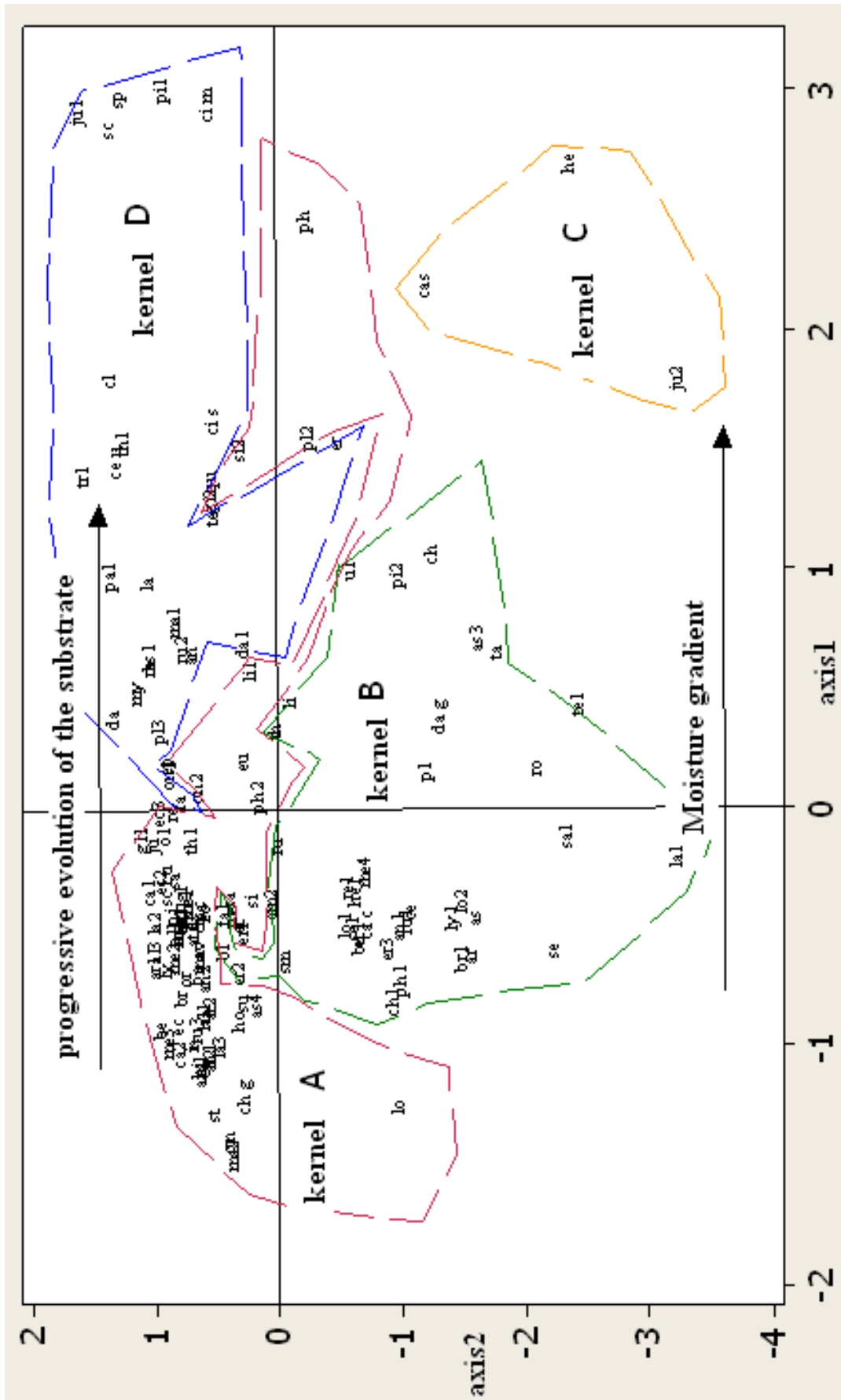


Figure 3. Factorial of species from the beach (axis 2 to axis 1)

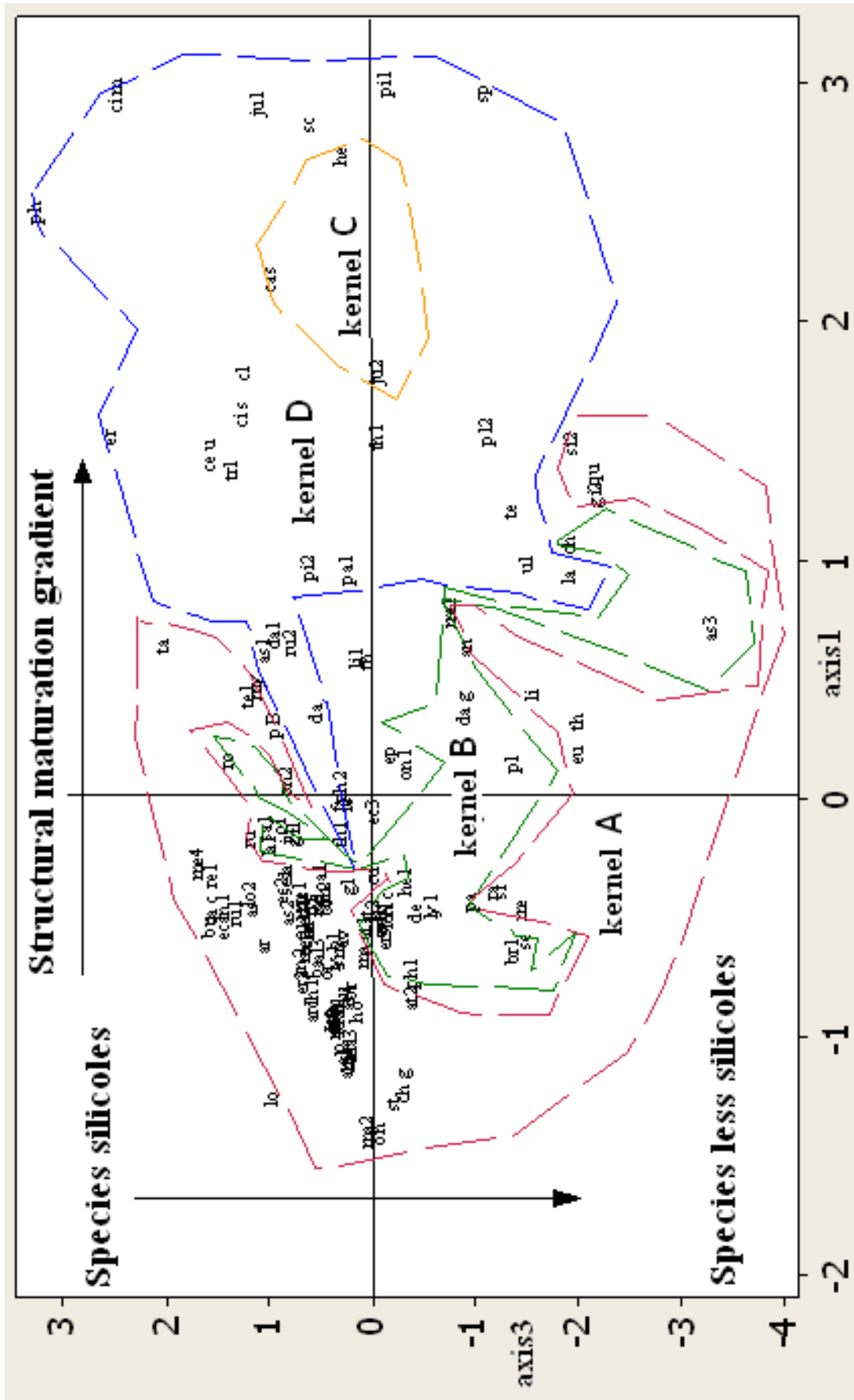


Figure 4. Factorial of species from the beach (axis 3 to axis 1)

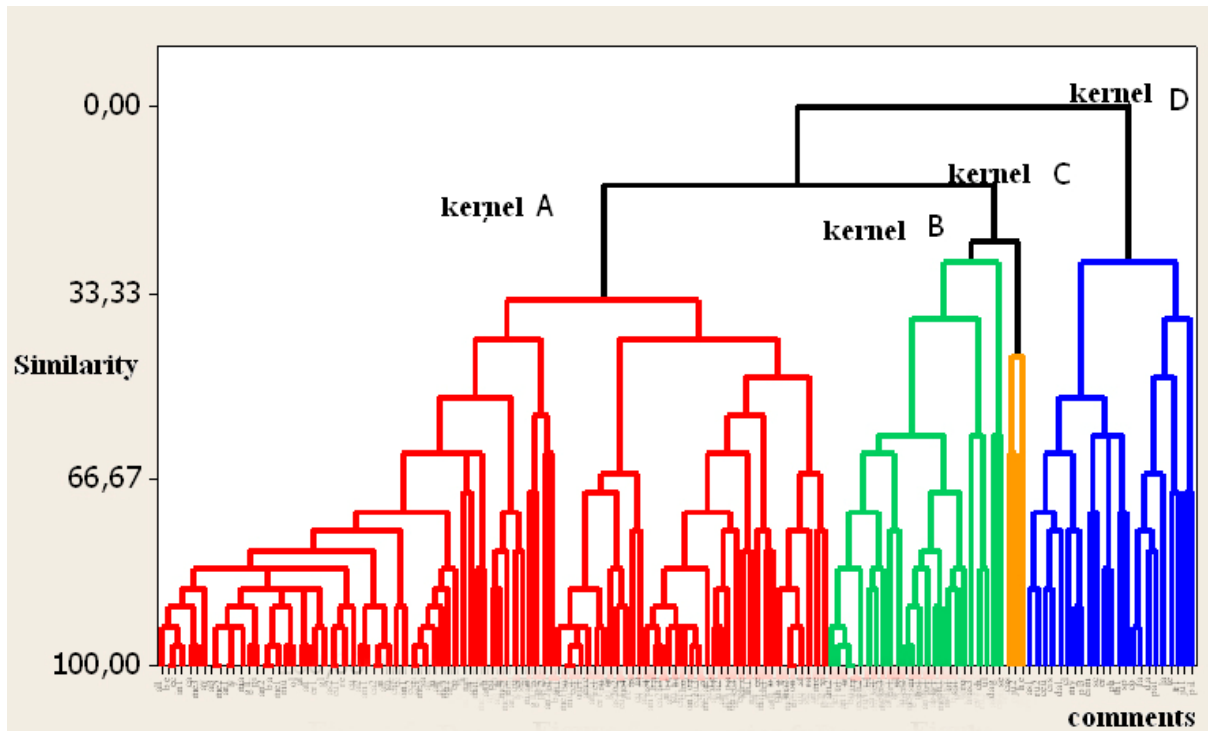


Figure 5. Dendrogram of the species from the beach

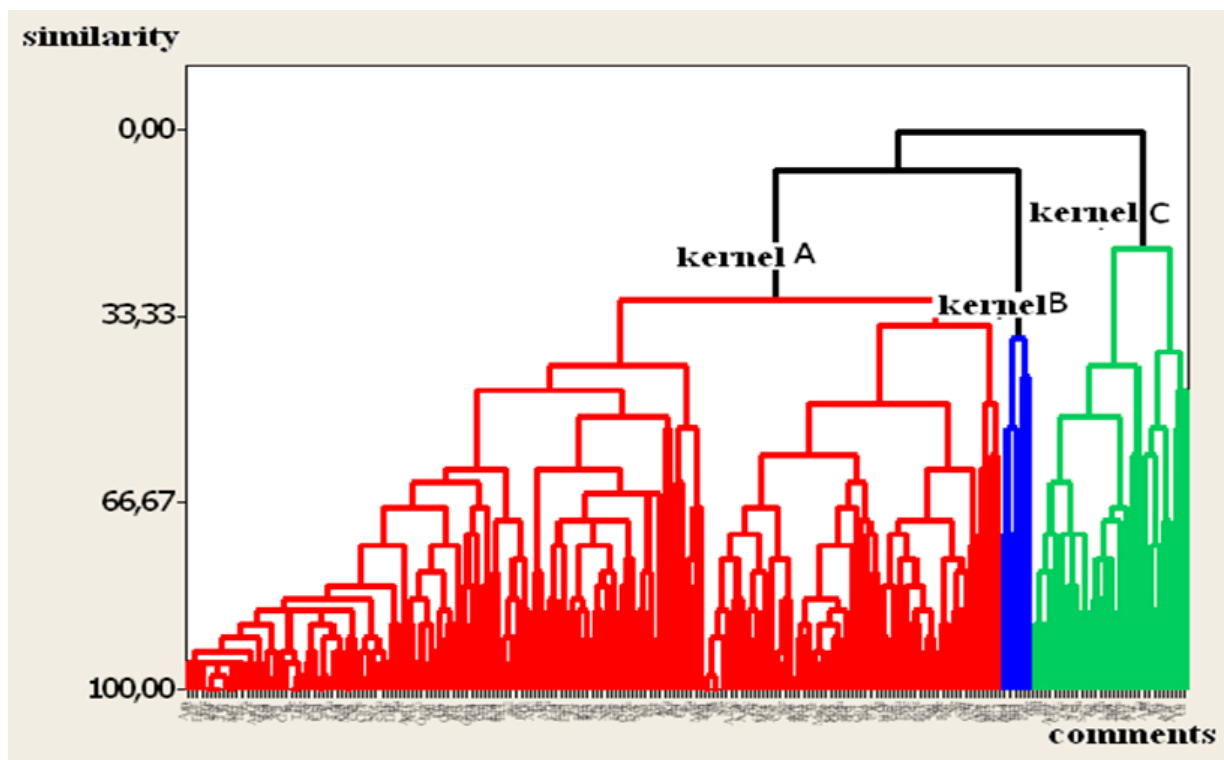


Figure 6. Dendrogram of coastal species

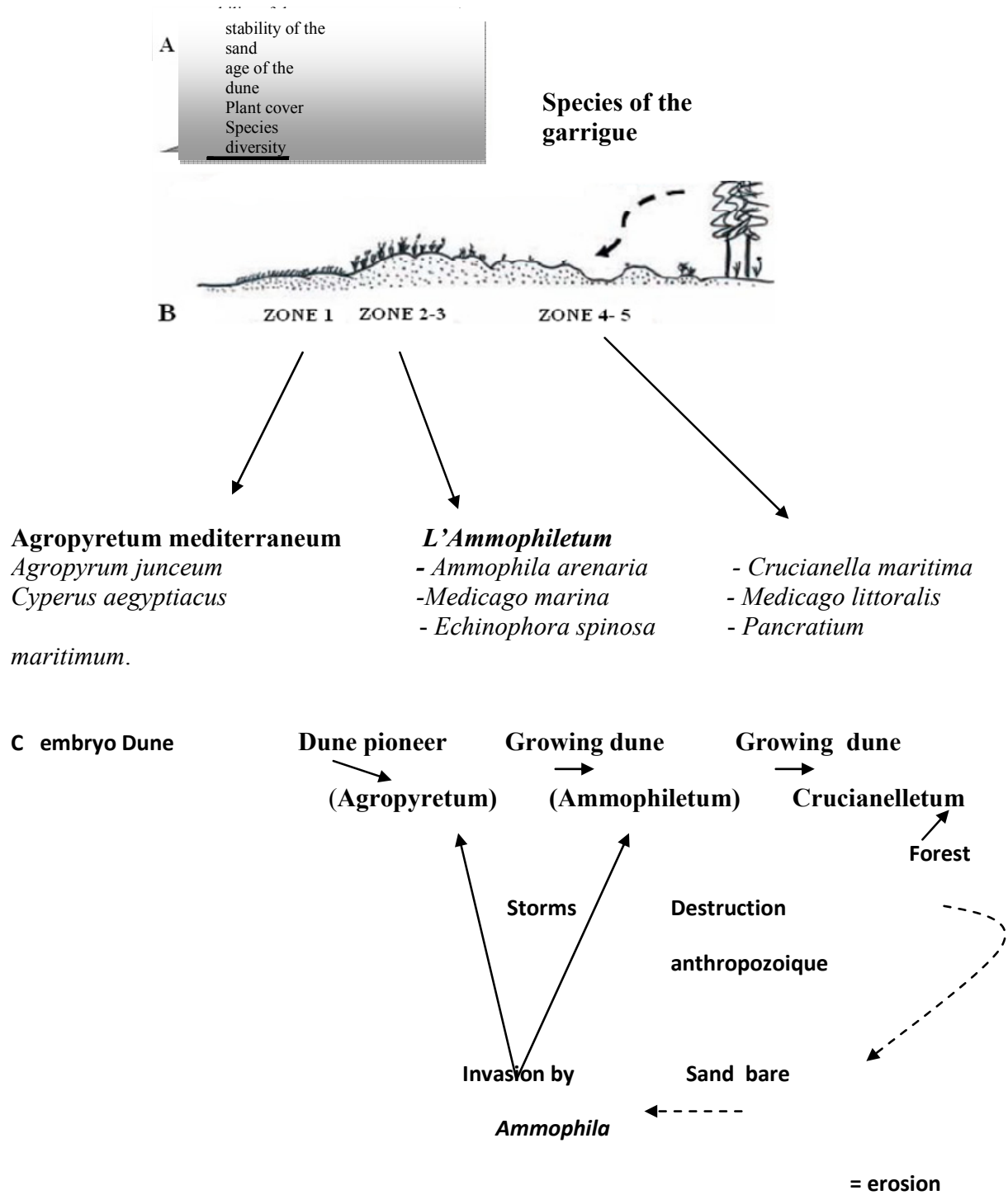


Figure 7. Schematic summary of the ecology of sandy coastline. (KUNHOLTZ – LORDAT 1923)

A: Appearance of the beach and summary of the reciprocal action of physical factors and vegetation. B: Vegetation Associations typical of different areas of the beach, with their characteristic species. These species are typically arranged in their order of appearance. C: Succession of the main plant associations of the sandy coastline. Disturbance (antropozoogenes or natural, tillé line arrows) cause regression of vegetation. The natural dynamics of the system leads to the establishment of a cyclic process.

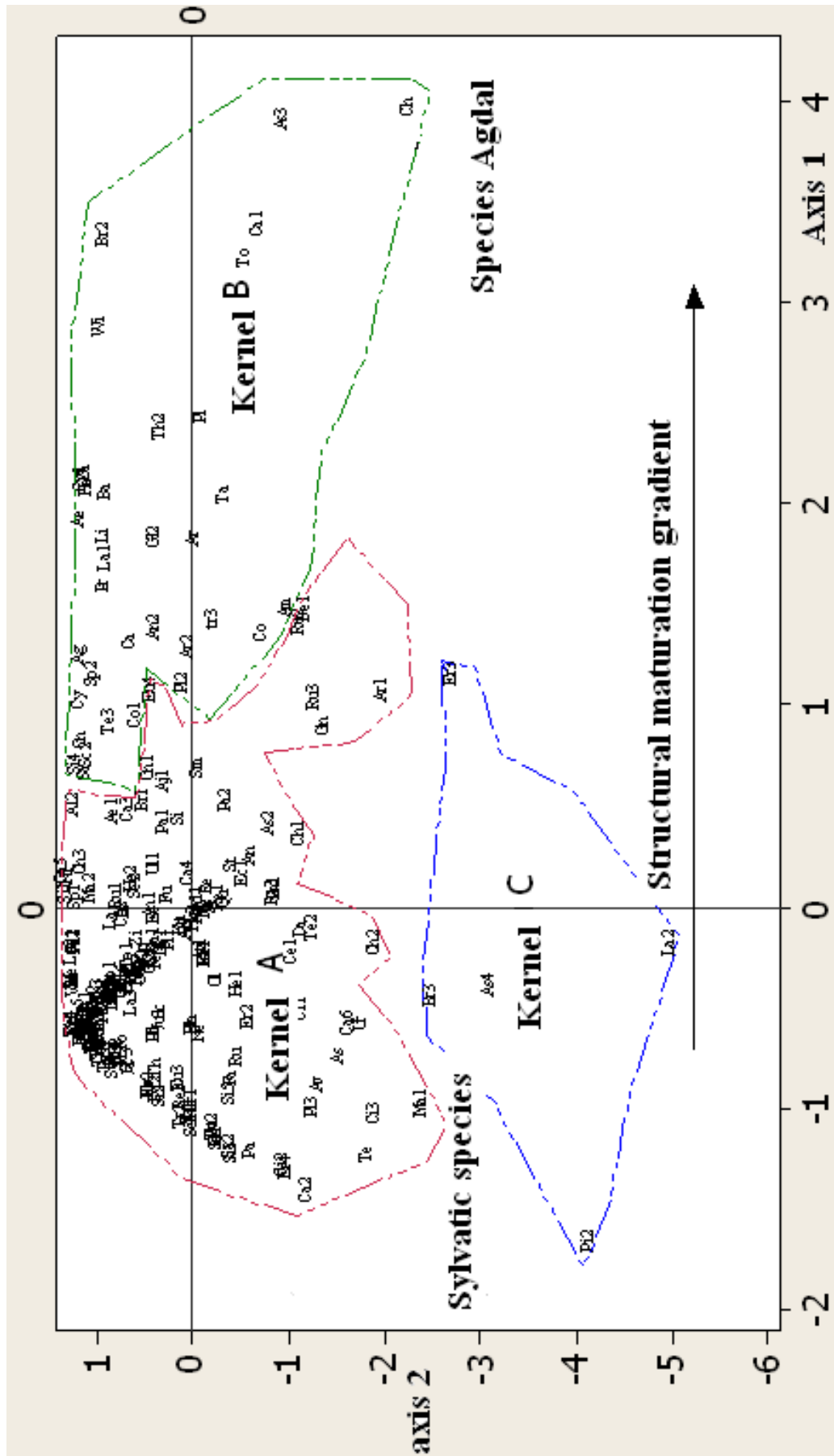


Figure 8. Plant factorial des especes du Littoral (axis 2 to axis 1)



#### 4. Results and Discussion (of the Species of the Coast)

It is a set of 57 phytosociological surveys and 223 species on the sandy coast of Sid Safi station; Rechgoune and Ghazaouet.

On the coast, the majority of the species belonging to the class of the **Therobrachypodieta**

##### 4.1 Plan 2/1:

Negative side: *Ammoides verticillata*, *Arisarum vulgare*, *Asparagus acutifolius*, *Asteriscus maritimus*, *Avena sterilis*, *Cistus ladaniferus*, *Cistus monspeliensis*, *Eryngium maritimum*, *Eryngium tricuspdatum*, *Marrubium vulgare*, *Lobularia maritima*, *Genista numidica*, *Pistacia lentiscus*, *Tetraclinis articulata*

Positive side: *Althaea hirsuta*, *Atractylis carduus*, *Carthamus coerulus*, *Centaurea pungens*, *Retama monosperma*

In this area we find species very opposed by their procession and their vocation. The first batch consists of pre-stock species where a semblance of woody atmosphere. The second batch of so-called species mate without any taxonomic convergence

##### 4.2 Plan 3/1 :

Negative side: *Aegilops ventricosa*, *Agropyron repens*, *Anthyllis tetraphylla*, *Avena sterilis*, *Atractylis concellata*, *Prasium majus*, *Plantago lagopus*, *Pistacia lentiscus*, *Tetraclinis articulata*, *Teucrium pseudo-chamaepitys*, *Echinops spinosus*, *Eryngium tricuspdatum*

Positive side: *Trifolium compestre*, *Teucrium polium*, *Stipa tenacissima*, *Smilax aspera*, *Raphanus raphanistrum*, *Reichardia picriodes*, *Reichardia tingitana*, *Quercus coccifera*, *Phylleria angustifolia*, *Ophrys apifera*, *Orchis coriophora*, *Medicago littoralis*

On the positive side there are relatively meso hygrophilous such as species *Ophrys apifera*; *Orchis coriophora* . and the negative side are relatively more tolerant species: *Echinops spinosus* ; *Eryngium tricuspdatum*; *Atractylis concellata*

This very clear axis to identify by a moisture gradient. Values are so low, they are difficult to interpret. The structuring of the cloud is no worse; Add to this the human conversations at this level leading to homogenization of the flora.

This region corresponds to a fixed dune characterized by a grouping evolved; plastic and weakly psammophilous, differentiated by *Juniperus phoenicea*, *Pinus maritime*, *Erica multiflora*, *Asparagus acutifolius*, *Asparagus stipularis*.

This advanced considered grouping formed the coastal juniperais. On the site map, it is aimed at altitudes of 100 m to 400 m, on slopes ranging from 5 to 25% and forming a collection of 70-90%; It is noted from the wet to the semi-arid.

The presence of this group of species is explained by its spatial heterogeneity and has his adaptation (R strategies). This plasticity confirms it a wider environmental spectrum, and colonization of the dunes by producing many seed species (*Pinus halepensis*; *Juniperus phoenicea*).

#### 5. Conclusion

The analysis of the A.F.C highlighted 03 vegetal groups that organise themselves on the map 2/1 and 3/1 according to a schema corresponding to the analysis of adaptive strategies (MAC-ARTHUR 1957) in Chaabane (1993). This segregation is a variation of soil moisture and textural and structural elements. Furthermore, Therophytiques nitrophilous species endowed with a strong potential biotic and reciprocal growth settled more easily, there will be designated the R selection, the form's own selection.

The three groupings sets are represented by:

Groups psammophilous by excellence:

*Ammophila arenaria*, *Cakile maritima*, *Calystegia soldanella*, *Eryngium maritimum*, *Medicago minima*, *Medicago marina*

These species pertaining to **Ammophiletea** and **Cakiletea maritimae** class. They occupy the vertices of the beaches in maritime borders and also it means vegetation psammo-halo-nitrophilous therophytes (Chaabane, 1993) that characterize the embryonic dunes.

In moving away from the beach, a very diverse vegetation moved to attach these dunes giving birth to more or less fixed bright dunes. This vegetation is related to the **Therobrachypodieta** class



The interaction of different natural factors has the mosaics of biotopes and vegetation structure. But this arrangement, linked to the variability of the physicochemical characteristics of the substrates, is particularly disturbed by the actions of origins anthropozoogenic.

This pressure results in depletion of the most advanced sets, a loss of 'natural' biodiversity of specific groups of the coast; it caused great difficulty in the individualization says beaches (*Cakiletea maritima*) or even of dunes fixed sets.

Finally, we say that the future is worrying about maintaining this national heritage. It is important that effective, even drastic measures be taken rapidly to alleviate this pressure of anthropozoic origin. Admittedly, this is not unique to the Algerian coast since it occurs in all countries of the Maghreb and on almost all of the territories, but the reduction of vested coastal areas to natural ecosystems is an aggravating factor.

It is with this concern to reduce the pressure, or even to improve the forest of the spit, that we brought the attention on *Ammophila arenaria*.

This species by their leaf system, its flexibility and its flexibility slows the speed of the wind and allow sand accumulation. It has good resistance to loosening and stabilizes the dunes by its root systems. Lay down the dunes and *Ammophila arenaria* in the coast plantations offer a picturesque great heritage value and original topography.

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