Phytodiversity the group to *Pistacia atlantica* Desf. in the Saharan Atlas (Bechar -Algeria).

Benaradj Abdelkrim\(^a\)*, Bouazza Mohamed\(^b\) & Boucherit Hafidha\(^a\)

\(^a\)University Center of Naama (Algeria)
\(^b\)Laboratory of Plant Ecology and Management of Natural Ecosystems, University of Tlemcen (Algeria)

Abstract

Research on the floristic The Saharan Atlas Bechar was undertaken. The Saharan Atlas covers important plant resources spread over the plains, mountains, chotts the Dayas and desert areas.

Their potential for biological resources and their impressive diversity across the country imperatively require a preservation strategy is developed. Ratification by Algeria, the Convention on Biological Diversity is an important step in the management of this valuable capital and an irrefutable proof which strengthens the position of our country in the conservation of biological diversity across planetary and in building sustainable development.

Our work is part of an overall framework that aims the preservation of plant species such as the case of the Atlas Pistachio (*Pistacia atlantica* Desf.) are currently the object of our concern.

It is a very special forest heritage since it is an interesting species in many ways. The Pistachio Atlas is a large powerful xeric very special tree trunk up to ten meters high.

The approach used consisted of floristic inventory from phytoecological identified in the pistachio range. The 50 surveys are conducted and 127 species (woody and herbaceous) belonging to 97 genres grouped into 36 families were inventoried.

The *Pistacia atlantica* is a promising species for Western Algeria, its adaptation to environmental stresses enables a dynamic and some biological recovery. Floristic diversity of the group to *Pistacia atlantica* is very special because of its biological characterization, systematic and phytogeographical. This review highlights the importance of endemic species-Saharan Africa through adaptation and resistance under more favorable typically Saharan bioclimate.

© 2015 The Authors. Published by Elsevier Ltd.
1. Introduction

Our work is part of an overall framework that aims the preservation of plant species such as the case of the Atlas Pistachio (*Pistacia atlantica* Desf.) are currently the object of our concern.

Monjauze (1965, 1968, 1980), located pistachio atlas in the Oran area in the western area of Algiers, the high steppe plains and the Saharan Atlas. The Pistachio Atlas widely dispersed and there grows exclusively in the Wadi beds and depressions days. The Pistachio Atlas is a forest and fruit species well known in Algeria.

This study aims to assess the distribution of Pistachio Atlas in Bechar region by a phytoecological approach. In this work, we will quantify the floristic and ecological data groupings *Pistacia atlantica* Desf. in relation to climate and soil conditions.

2. Materials and methods

2.1. Description of the study site "Bou Ayech"

The Station "Bou Ayech" is located 45 km in the southern part of the city of Beni oumif (Fig1). It is a homogeneous topographic together without major accident. It is located between X (31° 96' 66") latitude and Y (01° 53' 33.33") of longitude.
It is indicated by the Oued es Smar, with vegetation based: *Hammada scoparia, Olea europaea, Pistacia atlantica, Anabasis aretioides, Rhus tripartitum*, etc.

This is a very broad distribution surface of *Pistacia* so widely dispersed in the wadi beds encountered until the border area, all *Pistacia* represent a real progressive momentum by the appearance of new youth *Pistacia*.

Biogeographic, the station made part of the Saharan Atlas sector surveys are located in the sub sector within the meaning AS1 Quezel and Santa (1962). It is located on the glaze of the Quaternary.

2.2. Methodological Approach

The methodology comprises a device comprising a series of transects distributed in different topographic units of the study area.

We have opted for a systematic sampling of the kind transect running through the station. This sampling will be performed on physiologically and morphologically homogeneous geo facies.

The various parameters studied:
- **Vegetation recovery action:**
  The recovery of a species is theoretically defined as the percentage of the surface that would be covered, if projected vertically on the ground aerial organs of individuals of the species (Gounot 1969).
- **Measurement of floristic richness:**
  The rich flora of an area is the total number of species it contains, this floristic richness is generally even higher than the land area is larger, but of course thinks less fast than the area concerned.
- **Biological characterization:**
  Their biological type (Raunkiaer, 1934) indicated species identified in the study sites. Subsequently raw biological spectra (taking into account the absolute frequency) and actual (method of Tomaselli in Long, 1954) were determined for the four study sites. It is considered by phytogeographers as flora Adaptation Strategy to Climate Conditions (Daget, 1980), this classification takes into account the renovation bud position of the plant to the ground during the cold period can recognize 5 biological types defined by Raunkiaer (1934) according to the morphological nature and which are: phanerophytes, chamaephytes, hemicryptophytes, and Geophytes Therophytes.
- **Systematic characterization:**
  We have compiled a list of plants within the *Pistacia atlantica* group of distribution area according to their belonging to family and genus of plant species inventories.
- **Characterization Phyto-geographical:**

3. Results

The analysis of ecological data is certainly prior to the first order for the understanding of ecosystem functioning and Environmental Design. It is essentially an investigative tool, combination and because of using the information to, among others, a reflection on the development. (Long, 1975; Ozenda, Mederbal 1982 and 1992).

Our contribution concerns the study of biodiversity and phytogeographical pre-Saharan ecosystems.

3.1. Vegetation cover

The average recovery of the vegetation in the Bou Ayech station is 45%.

3.2. Floristic richness

Net diversification of flora, there were more than 127 species in the study station "Bou Ayech".
3.3. Biological characterization

The results of the floristic composition of the study sites are shown by the following biological characterization (Table 1).

<table>
<thead>
<tr>
<th>Biological types</th>
<th>Absolute frequency</th>
<th>Relative frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phanerophytes</td>
<td>06</td>
<td>4,72</td>
</tr>
<tr>
<td>Chameaphytes</td>
<td>25</td>
<td>19,69</td>
</tr>
<tr>
<td>Hemicryptophytes</td>
<td>20</td>
<td>15,75</td>
</tr>
<tr>
<td>Therophytes</td>
<td>68</td>
<td>53,54</td>
</tr>
<tr>
<td>Geophytes</td>
<td>08</td>
<td>6,3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>127</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 1. Biological spectrum of study station

Files must be in MS Word only and should be formatted for direct printing, using the CRC MS Word provided. Figures and tables should be embedded and not supplied separately.

The biological type of analysis in this resort shows that the biological spectrum of this resort is dominated by the presence of Therophytic species (53.54%), followed by Chamaephytiques species (19.69%), followed by the species Hemicryptophytiques (15.75%) and followed by Geophytes occupy (6.3%) and the phanerophytes (4.72%). It is of type: Th> Ch> He> Ge> Ph.

3.4. Systematic characterization

The study site is characterized by the following systematic floristic which includes 36 families, 97 genera and 127 species. From these systematic analyzes diversity in families and more nuanced gender in the study station (Table 2).

<table>
<thead>
<tr>
<th>No</th>
<th>Families</th>
<th>Number of Genres</th>
<th>Number of Species</th>
<th>No</th>
<th>Families</th>
<th>Number of Genres</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asteraceae</td>
<td>32</td>
<td>26</td>
<td>19</td>
<td>Malvacées</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Poaceae</td>
<td>13</td>
<td>12</td>
<td>20</td>
<td>Onagacées</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Brassiceae</td>
<td>9</td>
<td>7</td>
<td>21</td>
<td>Plombaginacées</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Fabaceae</td>
<td>7</td>
<td>3</td>
<td>22</td>
<td>Anacardiacées</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Lamiaceae</td>
<td>5</td>
<td>4</td>
<td>23</td>
<td>Urticacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Liliaceae</td>
<td>5</td>
<td>4</td>
<td>24</td>
<td>Rhamnacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Apiacées</td>
<td>4</td>
<td>3</td>
<td>25</td>
<td>Rosacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Caryophyllacées</td>
<td>4</td>
<td>4</td>
<td>26</td>
<td>Scrophulariaceae</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Chénopodiaceae</td>
<td>4</td>
<td>3</td>
<td>27</td>
<td>Thyméléacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Géraniacées</td>
<td>4</td>
<td>1</td>
<td>28</td>
<td>Capparidacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Resedaceae</td>
<td>3</td>
<td>1</td>
<td>29</td>
<td>Cistacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Borraginacées</td>
<td>3</td>
<td>1</td>
<td>30</td>
<td>Cucurbitacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Plantaginacées</td>
<td>3</td>
<td>1</td>
<td>31</td>
<td>Cynomoriacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Polygonacées</td>
<td>2</td>
<td>2</td>
<td>32</td>
<td>Ephédracées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Zygophyllacées</td>
<td>2</td>
<td>1</td>
<td>33</td>
<td>Joncaces</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Convolvulacées</td>
<td>2</td>
<td>2</td>
<td>34</td>
<td>Oléacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Euphorbiacées</td>
<td>2</td>
<td>1</td>
<td>35</td>
<td>Orobanchacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Astéracées</td>
<td>32</td>
<td>26</td>
<td>36</td>
<td>Palmacées</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
<td><strong>97</strong></td>
<td><strong>127</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. List of botanical families in the study station
3.5. Phytogeographical characterization

The phytogeographical spectrum analysis shows that Bou Ayech station is characterized by the dominance of the element with Endemic (22.83%), followed in second place by the Mediterranean element and the element with Sindien-Saharan (19, 69%).

In addition, there is the presence of the Pluri-regional component (17.32%), so the presence of multi-regional elements (Cosmopolitan, Tropical, Europe ...) can be caused by the fact of dissemination of seeds by various modes (anemochory, zoochory, rain, etc ...). For other items namely Saharan element (7.09%), Mediterranean-Saharan Africa (6.30%), link-Saharan-Mediterranean Sindien (3.94%) and the Ibero-Mauritanian (3.15%).

<table>
<thead>
<tr>
<th>Phytogeographical spectrum</th>
<th>Presence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endemic element</td>
<td>22.83%</td>
</tr>
<tr>
<td>Mediterranean element</td>
<td>19.69%</td>
</tr>
<tr>
<td>The Saharan-Sindien element</td>
<td>19.69%</td>
</tr>
<tr>
<td>The Pluri-regional component (Cosmopolitan, Tropical, Europe ...)</td>
<td>17.32%</td>
</tr>
<tr>
<td>The Saharan element</td>
<td>07.09%</td>
</tr>
<tr>
<td>Mediterranean-Saharan</td>
<td>06.30%</td>
</tr>
<tr>
<td>Mediterranean-Saharan- Sindien element</td>
<td>03.94%</td>
</tr>
<tr>
<td>Ibero-Mauritanian element</td>
<td>03.15%</td>
</tr>
</tbody>
</table>

4. Discussions

4.1. Vegetation cover

This improvement in the recovery rate is due to the process of biological recovery. According Le-Houérou (1995) "Biological recovery is the set of processes inverse to those of the steppe and desertisation. Biological recovery is characterized by increased permanant collection rate of perennial biomass, organic matter in soil, structural stability, permeability and water balance, biological activity and primary productivity, while the variability of annual production decrease."

4.2. Floristic richness

According Aidoud (1989), the rich flora in arid depends essentially annual species, environmental conditions and correlation of all the characters (climate, édaphisme and operation).

4.3. Biological characterization

The biological spectrum of the study site (Table) has a predominance of herbaceous stratum (therophytisation). This therophytisation is a characteristic of arid (Daget 1980; Barbero et al, 1990). According Negro (1966) and Daget, (1980), the therophytie is a coping strategy against adverse conditions and a form of resistance to the harsh climate.

4.4. Systematic characterization

The Asteraceae, Poaceae, Fabaceae and Caryophyllaceae, are families of Mediterranean affinity the most dominant in the floristic list of the study station vary according to latitude: they decrease from north to south. These families represent 35 to 40% of the flora in each Saharan sector (Ozenda, 1977). This dominance is justified since it is cosmopolitan families are widespread across the globe.
4.5. Phytogeographical characterization

This interaction includes a very high diversity and therefore deserves special conservation. Groups of Pistachio Atlas of Bechar region are characterized by a balance between med-sah-Abadan and Mediterranean flora with a high proportion of Saharan-Abadan species.

Finally, this modest study shows the importance of plant geography, used to study the phytodynamique. But also contributes to the knowledge of the impact of climate and anthropogenic change on ecosystems.

The interaction of Mediterranean and Saharan flora includes a very high diversity and therefore deserves special conservation.

5. Conclusion

The analysis of the floristic diversity of individual groups, their biological and chronological character would differentiate the different ecosystems and evaluate their heritage value, given their good management.

Our contribution concerns the study of biodiversity and ecosystems phytogeographical pre-Saharan grouping Pistachio Atlas. These hide great floristic diversity. This is related to the diversity of climates, geomorphology, nature of soils and human action.

The analysis of the floristic diversity of individual groups, their biological and chronological character would differentiate the different ecosystems and evaluate their heritage value, given their good management.


This species deserves adequate protection measures, particularly in its natural environment. Indeed, besides its forest and ecological interest, Pistachio Atlas may also have some economic interest, including serving as rootstock for fruit cultivation Pistachio (*Pistacia vera*) in semi-arid areas.

A better understanding of the issues and factors such Pistachio Atlas decline contribute to biodiversity protection and better regeneration of this species. In addition, a better understanding of the potential of this species allow better extension.

References


