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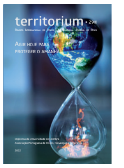

ECOSYSTEM DYNAMICS AFTER FOREST FIRE. BLIDEEN ATLAS CASE*

DINÂMICA DOS ECOSSISTEMAS APÓS INCÊNDIOS FLORESTAIS. O CASO DE BLIDEEN ATLAS

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ABSTRACT

Human disturbances affect the majority of terrestrial ecosystems. The radical changes in the behaviour of ecological systems, partial or total destruction of plant biomass, often with the death of fundamental entities. Of these disturbances, fires affect many terrestrial ecosystems, particularly forests, by changing their floristic composition, their structure and their functioning; the global average annual forest area burned is estimated at 65 million ha. The Mediterranean basin, a hotspot, annually loses between 0.5 and 1 million hectares of forest. In Algeria, the annual average of areas destroyed by fire is between 45,000 and 50,000 ha. Our work set out to study the changes in the plant coverage of the land one year after the passage of fire. We studied the effects at the floristic, ecological and dynamic level in a forest ecosystem located in the north of Algeria (Atlas Blideen). The phytoecological inventory of vegetation (74 surveys, 162 species) was carried out from subjective sampling. To highlight the different groupings in the study area, classical statistical treatments (factorial analysis of correspondences) were applied to the floristic and ecological data. The results of computer processing made it possible to individualize and classify four plant groups according to the degree of the fire. The qualitative and quantitative analysis of these groups shows a therophytization of the flora, due to the regression of the forest cover (disappearance of the phanerophytes) caused by the passage of fire, with a floral procession represented mainly by *Asteraceae, Poaceae* and *Fabaceae* and an index disturbance which greatly exceeds 50%. However, some tree and shrub taxa such as cork oak, holm oak and *Pistacia lentiscus* tree have the capacity to reappear by rejecting the calcined stumps.

Keywords: Dynamics, ecosystem, disturbance, forest fires, Atlas Blideen (Algeria).

RESUMO

Os distúrbios humanos afetam a maioria dos ecossistemas terrestres. Eles causam perturbações, mudanças radicais no comportamento dos sistemas ecológicos, destruição parcial ou total da biomassa vegetal, muitas vezes com a morte de entidades fundamentais. Entre esses distúrbios, os incêndios afetam muitos ecossistemas terrestres, em particular as florestas, alterando sua composição florística, sua estrutura e seu funcionamento. A área florestal média anual global queimada é estimada em 65 milhões de ha. A bacia do Mediterrâneo, a *hotspot*, perde anualmente entre 0,5 e 1 milhão de hectares de florestas. Na Argélia, a média anual de áreas ardidas varia entre 45.000 e 50.000 ha. Este trabalho tem como objetivo estudar as mudanças na cobertura vegetal do solo, um ano após a passagem do fogo, tanto a nível florístico, ecológico como dinâmico em um ecossistema florestal localizado no Norte da Argélia (Atlas Blidéen). O inventário fitoecológico da vegetação (74 levantamentos, 162 espécies) foi realizado a partir de amostragem subjetiva. Para evidenciar os diferentes agrupamentos na área de estudo, foram aplicados aos dados florísticos e ecológicos, tratamentos estatísticos clássicos (análise fatorial de correspondências). Os resultados do processamento informático permitiram individualizar e classificar quatro grupos de plantas de acordo com o grau de incêndio. A análise qualitativa e quantitativa desses grupos mostra uma terofitização da flora, devido à regressão da cobertura florestal (desaparecimento dos fanerófitos) pela passagem do fogo com um elenco floral representada principalmente por *Asteraceae*, *Poaceae* e *Fabaceae* e um índice de perturbação que excede os 50%. No entanto, algumas taxas de árvores e arbustos, como o sobreiro, a azinheira e a aroeira, têm capacidade de reaparecer por rejeição do toco calcinado.

Palavras-chave: Dinâmica, ecossistema, perturbação, incêndios florestais, Atlas Blidéen (Argélia).

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Introduction

For million years, fire has been considered an important factor in the ecology of plant formations (Gauthier *et al*. 2001), this phenomena destroy more trees than all other natural disasters combined (attacks by pests, insects, tornadoes, frost, etc.) it affects the physical integrity of the environment, the availability of resources and modifies the structure of populations, communities and the ecosystem; Many plant species have also developed certain morphological and physiological adaptations (Lloret, 1998; Trabaud et Lepart, 1980 in Guenon, 2010) guaranteeing them an extraordinary capacity for resistance and resilience to fire (Keeley,1986; Trabaud, 1994 in Guénon, 2010).

A systematic study of the post-fire flora shows the dominance generally fugaceous species. Trabaud (1980) had clearly demonstrated the increase in herbaceous plants, mainly annuals in the first years following the fire. These mainly come from the seed bank (Trabaud *et al*., 1997) and take advantage of the space freed by the fire. At the level of all vital attributes, the effect of the disturbance is generally reflected in an increase in therophytes. These disturbance effects are more visible the smaller the site. The increase in therophytes is explained by the opening of the medium, beneficial to taxa spending the summer season coinciding with the passage of fire in the form of seeds buried in the soil (Bonnet and Tatoni, 2003).

The Mediterranean climate, characterized by a summer drought, added to the presence of very combustible plant species, favors fires (Trabaud, 1987) which represent the first danger and the major disruptor of ecosystems.

According to Medoui (2013), studies on the effect of fire on vegetation in the Mediterranean region have been carried out mainly in the countries of the northern shore of the Mediterranean. Before, they were general and (or) descriptive studies such as the works of Kunholdtz-Lordat (1938, 1952), Barry (1960) and Le Houerou (1973). Later, and from the 1970s, further studies in France, both in the field in diachronic mode, and in the laboratory (study of the seed bank) were initiated by Trabaud (1970-1980).

In Algeria, although studies of a general nature have been published since the French occupation in the form of reports dealing with the causes of fires (Marc, 1916; Boudy, 1952) among others the ecology of fire in Algerian forests is poor documented. The only recent studies published on the subject are those of Moravec in 1990 in Sidi Bel Abbes and Bekdouche in 2010, Madoui in 2013 and in 2014 the studies of Meddour-Saher in Tizi-ouzou, which brought us to our problem: How the environment heals after fire?

The Atlas Blideen is a vast territory which presents a remarkable floristic and ecological diversity. He has suffered multiple change over time. This precious territory has not escaped the various disturbances, led by the fires that have ravaged large areas for years, which amounted to 43,445 ha from 1975 to 2013.

The only work on the impact of disturbances on the Blideen Atlas is that of Mekideche *et al*. (2018) who studies the impact of anthropogenic action by cattle on the Atlas Blideen suberies.

The objective of this work is to highlight the impact of fires on the dynamics of vegetation after fires in the Blideen Atlas.

To meet our objective we studied newly burned stations (the date of fire does not exceed one year) on the floristic, ecological plans for an attempt to understand the effect of fires on the vegetation cover and the healing of ecological systems after fire.

Physical and biotic setting of the area

Geographical location: The Blidéen Atlas belongs to the central part of the Tell Atlas in the north of Algeria, which extends from the southwest to the northeast and occupies an area of 1572.2 km^2 (fig. 1).

The Atlas Blidéen is a mountainous region of Alpine folding, whose highest point reaches 1629m (Koudiatte abd el kader) presents a strong slope on the north side towards the plain of the matidja and an attenuated slope on the south side towards the Highlands.

By referring to the various works carried out on the Blidéen massif, such as the works of (Halimi, 1980; Bouaoune, 1996; Zaidi, 2003 and Merbah, 2005) the Atlas Blidéen is characterized by the Mediterranean climate, the summer dry season varies from 3 months, the cold and rainy season. The annual average temperatures are between 11°C and 18°C, with an “m” varying from 0.4°C to 7.5°C. There is great rainfall variability with an average annual rainfall that ranges from 600 to 1500 mm. The bioclimate varies from sub-humid to humid, temperate and cool.

The soils of the Blidean Atlas are generally characterized by hard schistose and very siliceous soils. Brown forest soils are observed under the cedar groves (Nedjahi, 1988). Under the mesophilic green oak grove, there are decarbonated fersiallitic soils which are often disturbed by erosion (Dahmani, 1997). The latter author points out the presence of ranker-type soils at altitude in contact with cedar and holm oak Merbah (2005).

The flora of the Blidéen Atlas is part of the North African flora which generally shows a close affinity with that of the Mediterranean domain, characterized as a whole by its xerothermic conditions (Maire, 1963 inHalimi, 1980).

The vegetation stages characterize the Blidéen Atlas according to Meddour (1994) are:

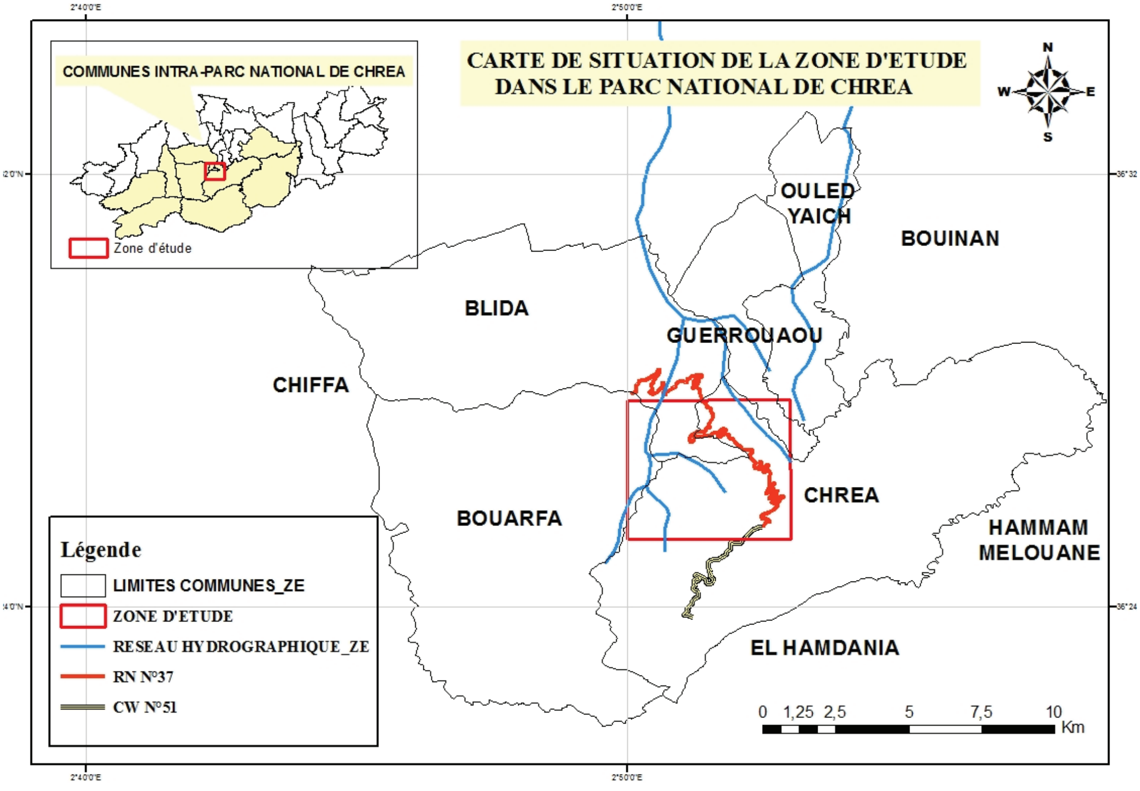

Fig. 1 - Geographical location of the study area.

***Fig. 1** - Localização geográfica da área de estudo.*

- The Supra-Mediterranean: identified by Meddour (1994), corresponding to deciduous, zenaie, maple and cedar forests and to the holm oak series (Dahmani, 2000);
- The Meso-Mediterranean: it corresponds to the series of holm oak (Dahmani, 2002) and to the series of cork oak (Meddour, 1994);
- The Thermo-Mediterranean: it characterizes the sub-coastal massifs. From a phytocoenotic point of view, it corresponds to the thermo-Mediterranean series of *Quercus rotundifolia* in the Algerian massifs (Dahmani, 2002) and the *olive-lentisque* series (Meddour, 1994).

Methodolgy:

Vegetation sampling

In our study we adopted a subjective sampling in burnt areas in the Blidéen Atlas, whose date of fire was perfectly known and which does not exceed one year.

Subjective sampling consists in choosing the location of the survey according to the apparent homogeneity of the vegetation (Gounot, 1969), floristic, structural and stationary homogeneity.

The structural elements sampled correspond to typical surveys in that they contain almost all of the species present in the repetitive structures identified. They are defined by their vertical size and the area they occupy, the nature of the dominant species, their structural complexity, their endogenous and exogenous ecological characters as well as their qualitative and quantitative floristic composition (Yahi, 2007).

The minimum surface area is 100 m², during the execution of the survey, we describe all the ecological parameters:

- Stationary parameters;
- The characteristics of the soil surface: we estimate the coverage of litter, coarse elements, outcropping rock and bare soil and note all the species present. Each of them is assigned its index of abundance dominance (Table I);
- Species identification was carried out according to the flora of Quezel and Santa (1962-1962).

Table I - Index of abundance dominance according to the scale of Braun Blanquet *et al.*, 1932.

Tabela I - Índice de dominância da abundância segundo a escala de Braun Blanquet et al., 1932.

Index	Coverage	Abundance
+	Very low	Very low
1	Poor	Abundant
2	From 5 to 25 %	Very abundant
3	From 25 to 50 %	Any abundance
4	From 50 to 75 %	Any abundance
5	From 75 to 100%	Any abundance

Data analysis

The processing used is factorial correspondence analysis (CFA) using software (SATISTICA 6.2) on a matrix of 74 records and 162 species.

AFC is a computer data processing technique. The contribution of species and records to an axis is the percentage of the variance extracted by that axis that goes to each species or record. The higher the contribution, the more important this species or record in the meaning of the axis. This parameter is therefore useful for interpreting the axes in terms of ecological factors.

During the interpretation, we therefore consider, first of all, the readings which contribute the most to the inertia explained by the different axes because they serve to specify the kernels of the released sets. Those with a low relative contribution are associated with the preceding ones in the various sets or groupings determined according to their compared contributions, their proximity on the factorial maps and their floristic and ecological similarities.

Quantitative evaluation

Specific richness (S): This is the simplest expression of biological diversity, it represents the number of species inhabiting a given space (Blondel, 1996).

Specific diversity indices (H '): The most commonly used diversity index is the Shannon index, which combines species richness and species fairness (Shannon and Weaver, 1949).

The Shannon diversity index (H ') is calculated by the following formula: $H' = -\sum Pi Log2 Pi$.

where pi is the relative abundance of species i. This value corresponds to the percentage of recovery of the species; it is obtained from the median values of the covering classes.

Specific diversity (H '): the specific diversity by applying the Schannon-Weaver index Equitability or regularity (E): Distribution of abundances.

The regularity of a stand is called the ratio of its diversity to maximum diversity (Frontier *et al.*, 1998). The formula applied is as follows:

$$E = H' / Hmax = H' / Log2S$$

Where H '= Shannon index. And S = specific richness.

Disturbance index (Ip): The disturbance index is used to estimate the degree of disturbance of the stand studied, calculated by the following formula:

$$Ip = \frac{\text{Therophytes (\%)} + \text{chamaephytes (\%)}}{\text{Total number of taxa}}$$

Qualitative Assessment

Taxonomic diversity: the species identified in each group identified by AFC are given in genera and families.

Biological diversity: The determination of the biological types of the species in the study area was based on the work of Raunkiae.

Results

Taxonomic diversity

From a systematic point of view the study area has 162 species with 47 families (Table II), the study of the specific composition of this flora shows that the most represented post-fire families are: Asteraceae, Poaceae and Fabaceae, which are usually therophytes.

Table II - Overall systematic characterization of the study area.

***Tabela II** - Caracterização sistemática global da área de estudo.*

N°	Family	Species	Kind
1	*Asteracees*	31	25
2	*Fabacees (Legumineuses)*	20	12
3	*Poacees(Graminees)*	20	18
4	*Lamiacees(Labiees)*	12	10
5	*Rubiacees*	9	6
6	*Caryophyllacees*	7	3
7	*Liliacees*	7	7
8	*Rosacees*	7	6
9	*Apiacees(Ombilliferes)*	6	6
10	*Brassicacees(Cruciferes)*	5	5
11	*Crassulacees*	4	2
12	*Borraginacees*	3	2
13	*Campanulacees*	3	2
14	*Gentianacees*	3	3
15	*Cistacees*	2	1
16	*Dipsacees*	2	1
17	*Ericacees*	2	2
18	*Fagacees*	2	1
19	*Geraniacees*	2	1
20	*Oleacées*	2	2
21	*Papavéracees*	2	1
22	*Pinacees*	2	2
23	*Polypodiacees*	2	2
24	*Primulacees*	2	2
25	*Ranonculacees*	2	2
26	*Scrofulariacees*	2	2
27	*Anacardiacees*	1	1
28	*Aracees*	1	1
29	*Asparagacees*	1	1
30	*Aspleniacees*	1	1
31	*Caprifoliacees*	1	1
32	*Convolvulacees*	1	1
33	*Cupressacees*	1	1
34	*Dioscoreacees*	1	1
35	*Euphorbiacees*	1	1
36	*Fumariacees*	1	1
37	*Hypericacees*	1	1
38	*Malvacees*	1	1
39	*Palmacees*	1	1
40	*Plantaginacees*	1	1
41	*Resédacees*	1	1
42	*Rhamnacees*	1	1
43	*Selaginellacees*	1	1
44	*Thymélaeacees*	1	1
45	*Urticacees*	1	1
46	*Valerianacees*	1	1
47	*Violacees*	1	1
Total	**47**	**162**	**147**

Quantitative Assessment

In groups I and II the specific richness (S), Shannon index (H ') and fairness (E) are more important than in groups III and IV (Table III), while the index disturbance is slightly greater than 50% for all groups, which explains the significant disturbance of diversity caused by the fire hazard. In groups I and II Specific wealth (S), the Shannon index (H') and equitability (E) are more important than in groups.

Table III - Quantitative characterization of the four groupings.

Tabela III - Caracterização quantitativa dos quatro agrupamentos.

Groupings	Species richness (S)	Specific diversity (H')	Equitability (E)	Disturbance index (Ip)
I	115	3,81	0,55	56 %
II	115	2,92	0,42	56 %
III	55	2,28	0,39	51 %
IV	45	2,56	0,46	52 %

Correspondence factor analysis

The graphical representation of the 74 surveys and 162 species determined by AFC and their physionomic characterization make it possible to delineate the different groupings, in the plane of axes 1 and 2, the surveys are organized according to a cloud of more or less concentrated points grouped into 4 large groups (fig. 2).

From the highest relative contributions of surveys and species, the analysis of the axes of orientation allows us to identify the following:

- Groups I and II form two sets of clouds, in the positive part of axis 1 grouping together high matorrals with *Quercus suber* "passive resistance pyrophyte", and medium mixed matorrals with *Quercus suber* and *Quercus ilex*, with opposite in the negative part, are located the groups III and IV, corresponding to the records of the average matorrals with *Quercus ilex* and *Arbutus unedo* which are "pyrophytes with active resistance", therefore axis 1 reflects a dynamic axis of response of the species to the scourge of fire;
- The highest relative contributions of axis 2, groups together at the positive pole the groupings encountered in the North exposures, on the contrary to the negative pole we find the groups in the South exposures, which means that axis 2 is an exhibition axis;

We distinguish on the negative side of axis 1, the surveys carried out in the regenerations of the formations with *Quercus suber* and *Quercus ilex*, which form high and medium matorral (photo 1) after the disappearance of the dominant entity *Pinus halepensis* (active *pyrophyte*) by the passage fire, associated in the shrub layer with *Ampeledesmos*, *Calicotome spinosa*, *Erica arborea*, (photo 2) *Pistachia lentiscus* which have the capacity to regenerate by seeds and / or by rejection of the calcined stump, after partial or total destruction, of their aerial organs by the fire (active *pyrophyte*);

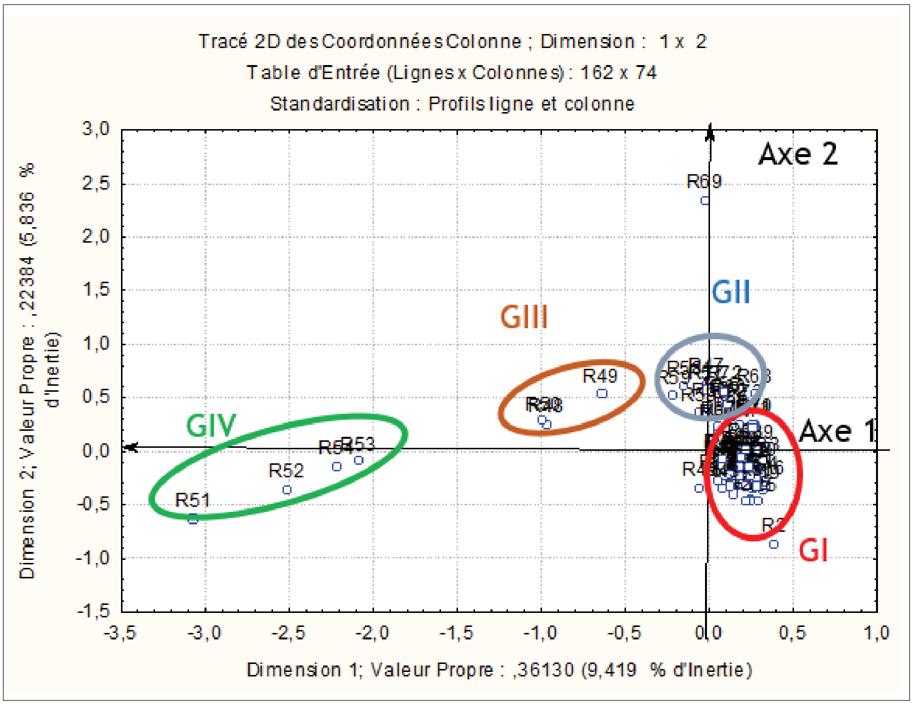

Fig. 2 - Distribution of plant groups according to AFC / Surveys in the plane of axes 1 and 2.

Fig. 2 - Distribuição dos grupos de plantas segundo AFC / Surveys no plano dos eixos 1 e 2.

Photo 1 - Mixed cork oak and holm oak matorral one year after the fire (Municipality: Chréa / Locality: Bni Ali) (Photograph by Melouani, taken in May 2014).

Fot. 1 - *Misto de sobreiro e azinheira matorral após um ano de incêndio (Município: Chrea / Local denominado: Bni Ali). (Fotografia de Melouani, tirada em maio de 2014).*

In the herbaceous layer we find the appearance of the taxa *Ephèmères heliophyles* and *therophytes* which are favored by the opening of the medium after passage of fire such as: *Anagallis arvensis*, *Daucus carota*, *Andryala integrifolia*, *Trifolium campestre*.

In the first few centimeters of the soil surface of these formations we find seedlings of *Pinus halepensis* (photo 3).

In the positive side of axis 1 and the positive side of axis 2 we find the regenerated pure pre-forest formations *of Quercus suber L.* (passive combustion *pyrophyte*) which has an exaggerated reputation of being incombustible (difficult combustion) (photo 4).

Photo 4 - High *Quercus suber* matorral one year after the fire (Municipality: Chréa / Locality: Hakou faraoun) (Photograph by Melouani, taken in May 2014).

Fot. 4 - *Alto Quercus suber matorral após um ano do incêndio (Município: Chrea / Local denominado: Hakou faraoun) (Fotografia de Melouani, tirada em maio de 2014).*

In the shrub layer we see the regeneration of *Calicotome spinosa*, *Cytisus*, *Rubus ulmifolius* and *Cistus monspeliensis*, and in the herbaceous layer we also find ephemeral species, annual heliophyla such as *Anagalis arvensis*, *Andryala, Daucus carotta, Trifolium compestre*.

In these formations the fire broke the dormancy of the seeds of *Quercus suber* (photo 5).

Photo 2 - Regeneration of *Pistacia lentiscus* (a) and *Erica arborea* (b) one year after the fire (Photograph by Melouani, taken in May 2014).

Fot. 2 - *Regeneração de Pistacia lentiscus (a) e Erica arborea (b) após um ano do incêndio (Fotografia de Melouani, tirada em maio de 2014).*

Photo 3 - Regeneration of *Pinus halepensis* one year after the fire (Municipality: Chréa / Locality: Bni Ali) (Photograph by Melouani, taken in May 2014).

Fot. 3 - *Regeneração de Pinus halepensis após um ano do incêndio (Município: Chrea / Local denominado: Bni Ali) (Fotografia de Melouani, tirada em maio de 2014).*

Photo 5 - One-year-old *Quercus suber* seedling in a burnt plot (Municipality: Chréa / Locality: Hakou faraoun) (Photograph by Melouani, taken in May 2014).

Fot. 5 - *Quercus suber com um ano de idade em área queimada (Município: Chrea / Lieu-dit: Hakou faraoun) (Fotografia de Melouani, tirada em maio de 2014).*

In the negative side of axis 1 and the positive side of axis 2 we find a group with formation of medium matorral by regeneration of *Quercus ilex* (active py*rophyte*) (photo 6 and 7) and *Phillyrea angustifolia* which testifies to the forest environment and the healing of the middle after the passage of fire, in the lower stratum we find the regeneration of shrubs such as *Pistacia lentiscus* by rejection of calcined stump and *Cistus Monspeliensis* and of herbaceous plants such as *Panicum virgatum, Avena sterilis, Lavendula stoechas* and *Daucus carota.*

In the negative side of axis 1 and negative side of axis 2, there is a grouping with formation of middle matorral with *Arbutus unedo* (active *pyrphyte)* (photo. 8) which becomes dominant after the destruction of *Pinus halepensis* by the passage of fire (photo. 9), in the lower stratum finds regeneration by rejection of strains of *Pistacia lentiscus, Phillerya,* and *Cistus* and the growth of annuals such as *Ebenus, Carthamus* and *Galactites tomentosa.*

In these formations we find regeneration by sowing *Pinus halepensis* (photo 10).

Photo 6 - Significant matorral in *Quercus ilex* one year after the fire (Municipality: El Hamdania / Locality: Sidi Aissa) (Photograph by Melouani, taken in May 2014).

Fot. 6 - Significante matorral em *Quercus ilex* após um ano do incêndio (Município: El Hamdania / Local denominado: Sidi Aissa) *(Fotografia de Melouani, tirada em maio de 2014).*

Photo 7 - Regeneration of *Quercus ilex* by sucker one year after the fire (Photograph by Melouani, taken in May 2014).

***Fot. 7** - Regeneração de Quercus ilex por ventosa após um ano de incêndio (Fotografia de Melouani, tirada em maio de 2014).*

Photo 8 - Medium matorral with *Arbutus unedo* one year after the passage of fire (Municipality: El Hamdania / Locality: Sidi Aissa) Photograph by Melouani, taken in May 2014).

***Fot. 8 -** Matorral de Arbutus unedo após um ano da passagem do fogo (Município: El Hamdania / Local denominado: Sidi Aissa) (Fotografia de Melouani, tirada em maio de 2014).*

Photo 9 - Regeneration of the charred stump of the strawberry tree a year after the fire (Photograph by Melouani, taken in May 2014).

***Fot. 9 -** Regeneração do toco carbonizado do medronheiro após um ano de incêndio (Fotografia de Melouani, tirada em maio de 2014).*

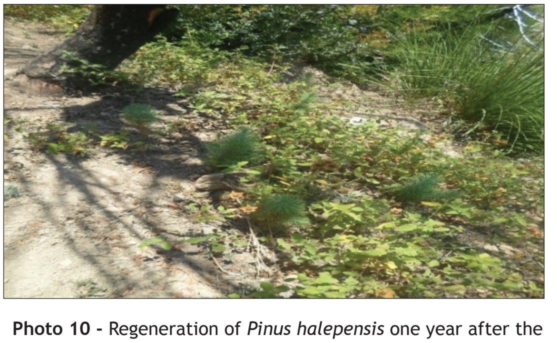

Photo 10 - Regeneration of *Pinus halepensis* one year after the fire (Municipality: Hamdania / Locality: Sidi Rabah) (Photograph by Melouani, taken in May 2014).

***Fot. 10 -** Regeneração de Pinus halepensis após um ano do incêndio (Município: Hamdania / Lieu-dit: Sidi Rabah) (Fotografia de Melouani, tirada em maio de 2014).*

Discussion

AFC analysis highlighted the strategy and response of plant species to fire.

In the formations with *Quercus suber* (true pyrophyte) the ecosystem is reestablished by the capacity of this species to regenerate by rejection of the calcined stump, the *Quercus suber* is a difficult combustion species "*pyrophyte with passive resistance*" play a role in degradation of primitive stands, when they are part of their floristic composition, they end up becoming dominant because the others regress, so they give open forests of a special type, often with a single dominance (kuhnholtz-Lordat, 1958).

In the *Pinus halepensis* formations the fire destroys the tree, and the presence of charred pids on land testifies to its existence before the passage of the fire, the disappearance of the dominant species in these formations makes appear new dominant entities which have the rapid power to regenerate by rejection of calcined stump such as *Quercus ilex* which regenerates by rejection or sucker "[...] *it is a tree which rejects stumps very well and gives abundant suckers, especially after fire*" (Lapie and Maige, 1914), *Quercus suber* and *Arbutus unedo* which adapts to fire "[...] *the charred stump emits new branches traumatized by aerial budding*" (Kuhnholtz, 1958), plants that resist fire, they have an exaggerated reputation of being incombustible, these difficult-burning species play a role in the degradation of primitive stands, when they are part of their floristic composition; they end up becoming dominant because the others regress, so they result in open forests, of a special type, often with a single dominant, sometimes with several co-dominant (Trabout, 1976). While the pines, known as "active pyrophytes" are plants whose propagation, multiplication or reproduction are stimulated by fire (kuhnholtz-Lordat, 1958), Trabaud (1970 - 1980) admits as "*true pyrophytes*", plants which are both resistant to fire and favored by it.

In the shrub layer we find *calicotome spinosa* and *Ampelodesmos mauritanica*, as well as *Erica arborea, Pistacia lentiscus* and *Cistus monspeliensis*, the presence of these two species indicate a clear sign of degradation of the cork oak forest, mainly due to a recent fire (Brakchi, 1998).

Cistus monspeliensis, also colonizes the shrub layer and covers a significant part. This species often appears in slicks, especially after forest fires.

These herbaceous taxa take advantage of disturbances to express themselves and recreate their seed stock. At the level of the plot (or local level), the changes observed are of great amplitude and correspond to rapid displacements and replacements of individuals and populations. These consist more precisely in the appearance, between the first and the second year, of a pool of taxa called "fugaces" which are in majority therophytes, anemochores and ruderal, and which disappear en masse between the second and the third year.

The seed bank then plays an important role (Trabaud *et al.*, 1997) indicate that, although the seed bank and the overlying vegetation can have quite different floristic compositions (in plant formations such as pine or holm oak), latent vegetation plays an important role in the early stages of post-fire recolonization. avaged by the flames (Megrerouche, 2006).

The main results from this work allow a physiognomic and ecological identification of the vegetation after fire and to present on scientific bases the taxa best adapted and the taxa moost vulnerable to this phenomenon and especially to highlight the state of the formations forest as well as evaluation qualitative and quantitative of the consequences on flora after t.he fire has passed Indeed, only the synchronic approach will allow us to better understand the dynamic post-fire and to propose predictive models of the evolution of vegetation after fire.

Conclusion

The sampling of the structural elements applied allowed the collection of floristico-ecological data in relation to the problem posed, the multivariate analysis (AFC) resulted in the individualization of 4 distinct groups according to their relation to fire.

On the physiognomic level, the study of burnt groups marks the substitution of certain species by others such as the Aleppo pine which is sensitive to the passage of fire (active pyrophyte) by the holm oak or the strawberry tree, on the other hand in the formations with cork oak the latter it remains dominate by their capacity of regeneration by rejection after the passage of fire.

The herbaceous layer made up of heliophyte, ephemeral and therophyte species favored by the opening of the environment and the presence of favorable conditions in which the growth of seeds, buried in the soil, is spontaneously generated after the passage of a fire. Some plant species are endowed with ingenious adaptive strategies in order to recolonize areas r Leck *et al.* (1989) and Thompson *et al.* (1997) in Bonnet and Tatoni (2003) indicate that seed banks in the Mediterranean region are essentially made up of persistent taxa corresponding to herbaceous species, and contain very few woody taxa which generally reject strain after disturbance.

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