

Phytodiversity According to the Degree of Flammability During the 2022 Autumn Season of the Zarifet Forest (Tlemcen-Algeria).

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ABSTRACT

The Zarifet forest, a nature reserve that is an integral part of the Tlemcen national park, rich in phytodiversity, this forest is characterized by a degraded cork oak formation invaded by the cistus ladanifer following a fire. Our study is based on the current state of the vegetation during the autumn season by carrying out the floristic inventory in order to analyze the different aspects of the plant cover according to its degree of flammability. The results show us that the plant cover is dominated by the following families: fabaceae, poaceae, fagaceae, thymeleaceae, liliaceae with the presence of a few feet of pinaceae and oleaceae. The composition of the flora is dominated by eudicots. Phanerophytes and chamaephytes represented by a high percentage, the same is the case for woody perennials and herbaceous perennials, the tree and shrub stratum as well as the Mediterranean and West-Mediterranean element. Sensitivity to fire is expressed by 54% of extremely flammable plant species, 13% of moderately flammable plant taxa with the absence of low flammable plant bases and 33% of plant subjects with no degree of flammability.

Keywords: phytodiversity, forest, flammability, autumn, Zarifet (Tlemcen).

Mathematics Subject Classification: 62P10

Journal of Economic Literature (JEL): Q00

1. INTRODUCTION

According to (Saidi, 2017), the five ecoregions of the world with a Mediterranean climate cover an area equivalent to only 1.6% of the emerged surfaces, of which nearly 80% around the Mediterranean (Medail and Quezel, 1997). The Zarifetse forest is characterized by exceptional biodiversity (Cowling et al., 1996). The specific richness is estimated at 25,000/30,000 species and subspecies (Medail et al., 2012) and a high richness in rare plants mainly concentrated in large plant families (Dominguez Lozano and Schwartz, 2005). The Mediterranean basin alone contains more than 10% of the world's plant species (phanerogams and pteridophytes). In Europe, 80% of endemic plants are Mediterranean (Blondel and Aronson, 1999).

In North West Mediterranean Africa, an initial assessment was attempted in 1978 by Quezel, who showed the presence, outside the Saharan portions of the three countries, of 916 genera, 4034 species including 1038 endemic (Babali, 2018).

According to (Saidi, 2017), Algeria occupies the seventh position in terms of wealth in number of taxa. This flora has 3139 species distributed in nearly 150 families, of which 653 species are endemic, i.e. an endemism rate of approximately 12.6%.

The flora of the Tlemcen region has 322 species, i.e. 10.26% of the Algerian flora. They belong to the subdivisions of gymnosperms and angiosperms; with 62 families and 193 genera. This represents nearly 42.18% of the existing families in the flora of Algeria with 18% of the genera. Gymnosperms make up 1.55% of the region unlike angiosperms which dominate. The latter constitute 98.45% of the maquis with 84.21% of Eudicots and 13.93% of Monocots (Henaoui, 2013).

The assessment of fires in the region of Tlemcen during the last 10 years (from 2001 to 2009 inclusive):

- Number of fires: 345
- Burned area: 21,351 ha including 1,583 ha in forest.

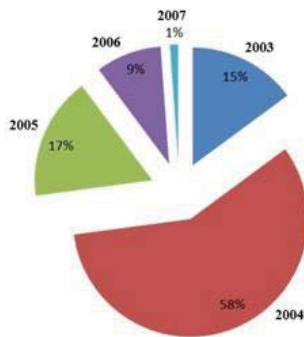


Figure 1. Burned areas (Belhacini, 2010).

The years when there were the most burnt areas are the years 2004 (14662 ha), 2005 (1876 ha) and 2001 (1725 ha), We notice a clear difference in burnt area during the year 2007 compared other years (Belhacini, 2010).

The objective of our study is to analyze the current state of the vegetation according to the degree of flammability during the autumn season of the forest of Zarifet (Tlemcen).

2. METHODOLOGY

2.1. Phytodiversity

The floristic analysis method is a key factor in better determining the current state of a given region. Among the different vegetation survey methods currently known, we thought that the so-called phytosociological or stigmatist method (Braun-Blanquet, 1951) is the most appropriate for identifying the problem and achieving the objectives of the study. It allows a complete study of the vegetation and its biogeographical distribution using the technical survey.

Indeed the location of the statement is chosen subjectively so that it is homogeneous, because it represents the plant communities. The area to be sampled depends on the type of vegetation and cover; it is greater than or equal to the minimum area and defined by the species-area curve.

On this subject, (Godron, 1971) adds that to control the representation of samples (readings) the most common procedure is that of the "species-area" curve. Indeed, this method consists in listing the species on a plot of 1 m² then it will be doubled and are then added the new species which appear. By successive duplication, it is assumed to arrive at a surface (1+2+3+...+n) from which no new species appear (Gounot, 1969).

In our case, the minimum area for Zarifet stations is 128 m² (Figure 2).

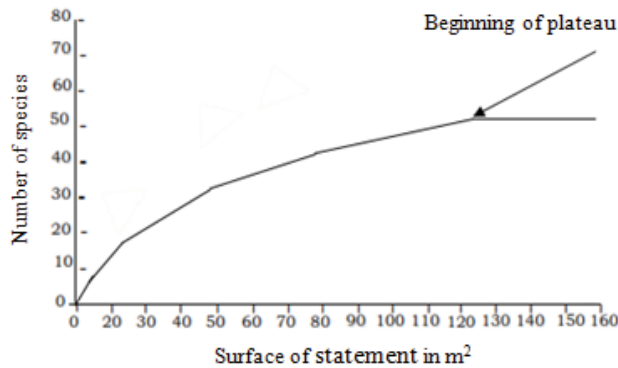


Figure 2. The curve of the minimal surface of the Zarifet station.

2.1. The degree of flammability

2.2. Sample collection

The collection of samples was carried out on October 04, 2022.

2.3. The method used (Basic method)

In order to determine the sensitivity to fire of plant formations in the study area (Mont de Zarifet), we adopted as a method that of INRA in Avignon (Valette, 1990 and Moro, 2004) to measure the degree of flammability of 10 plant species (*Calicotome intermedia*, *Ampelodesma mauritanicus*, *Ulex parviflorus*, *Quercus suber*, *Daphne gnidium*, *Pinus halepensis*, *Lonicera implexa*, *Cistus ladaniferus* subsp. *africanus*, *Chamaerops humilis* and *Crataegus oxyacantha*). To this end, a parameter was taken into consideration: the ignition delay, thus expressing the flammability (The time in seconds was calculated by a multi-turn stopwatch for the ignition delay. A test consisting of three samples of each plant taxon (the aerial part: leaves, stems, branches and buds), (10g for each) measured by an electric scale (1/1,000 of a gram) for each plant species was implemented using an infrared burner, the temperature in which the samples begin to burn was measured by a temperature probe of a multimeter which corresponds to position 10 (850°C) In order to have a flammability rating for each taxon plant, two elements are necessary: the average time of inflammation and the frequency of inflammation. For our case, we took only the first because all the subjects present positive tests by

using the classes resulting from the following formula: (Class interval sse = the maximum value – the minimum value / class number) Henaoui (2018).

3. RESULTS AND DISCUSSION

3.1. The station description

The station is exposed to the North, it is defined by uneven terrain, a 70% slope, 80% plant cover (hard-to-reach terrain), the appearance of bedrock, the dominance of perennial plant species and the absence of annual plants. We noticed the regeneration of Aleppo pine and cork oak, we analyzed the regeneration of Aleppo pine (*Pinus halepensis*) eight months after the passage of the fire. The natural regeneration of the Aleppo pine is estimated through the counting of seedlings according to a protocol defining 03 zones: under the crown, at the limit of the crown and 10 meters from the crown. The results obtained show that the Aleppo pine reoccupies the burned environment especially towards the limits of the crown and secondarily under the crowns and ten (10) meters from the crown. The presence of a foot of *Chamaerops humilis* which indicates the degradation of the environment and the presence of clearings. The dominant plant taxa are: *Quercus suber*, *Cistus ladaniferus* subsp. *africanus*, *Ampelodesma mauritanicus* and *Calicotome intermedia* by observing the association or the cohabitation of three plant species (*Ulex parviflorus*, *Lonicera implexa* and *Cistus ladaniferus* subsp. *africanus*) this is probably due to the phenomenon of Allelopathy.

The plant species inventoried are as follows:

Calicotome intermedia, *Ampelodesma mauritanicus*, *Ulex parviflorus*, *Quercus suber*, *Daphne gnidium*, *Asparagus acutifolius*, *Pinus halepensis*, *Lonicera implexa*, *Cistus ladaniferus* subsp. *africanus*, *Eryngium tricuspidatum*, *Chamaerops humilis*, *Phillyrea angustifolia*, *Crataegus oxyacantha*, *Marrubium vulgare* and *Pistacia lentiscus*.

3.2. Bioclimate

(Bagnouls and Gaussen, 1953) have established a diagram which makes it possible to identify the duration of the dry period based on the comparison of the monthly average temperatures in °C with those of precipitation in mm; assuming that the month is dry when “ $P \geq 2T$ ”.

The study area is located in a Mediterranean climate; and for all the stations, the summer drought period exceeds three months, it undergoes an increasingly important evolution (Figure 3).

The ombrothermic diagram is established for the Zarifet station, for the new period (1975-1996).

(Dreux, 1980) specifies that the climate is dry when the temperature curve is above that of precipitation, and humid otherwise.

For the study area, the climate is changing since the duration of drought follows an increasing gradient; because the area between the two curves is more and more important nowadays.

The duration of the dry period imposes a high evapotranspiration on the vegetation and woody species manage to survive thanks to their adaptation systems.

The period shows a drought duration of 5 months, coinciding with the summer period.

It should be noted that with this climate change in parallel, there are changes in the diversity and distribution of vegetation.

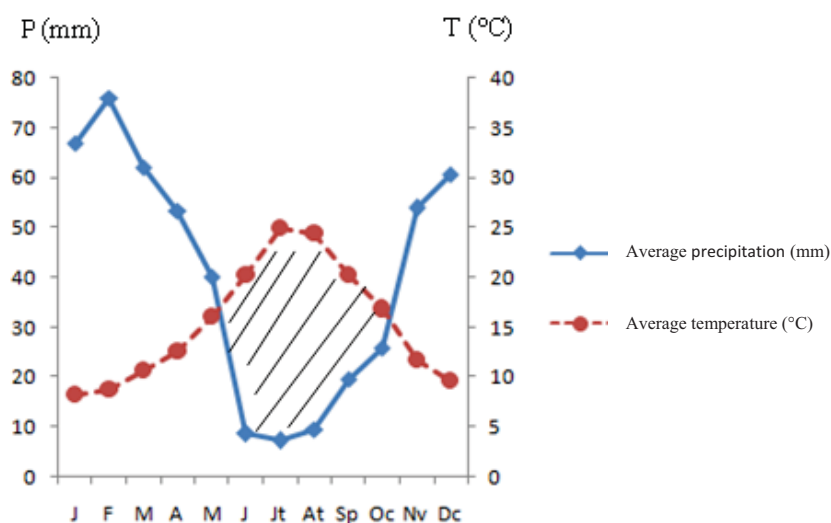


Figure 3. Ombrothermic Diagrams for Zarifet Station (1975-1996).

3.3. Systematic composition

Figure 4 shows us that the best represented families are Fabaceae (2), Lamiaceae (1), Liliaceae (1), Poaceae (1), Fagaceae (1), Cistaceae (1), Thymeleaceae (1), Pinaceae (1), Oleaceae (1) and Caprifoliaceae (1), and Rosaceae (1).

The floristic procession includes 14 families, 15 genera and 15 species.

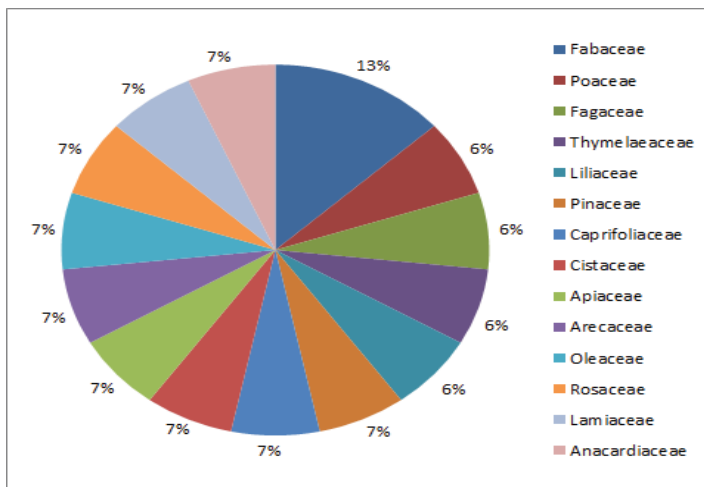


Figure 4. The composition of the flora by family.

Gymnosperms constitute 13.33% of the study area unlike angiosperms which largely dominate. The latter constitute 86.66% of the matorral with 66.66% eudicots and 20% monocots (Figure 5).

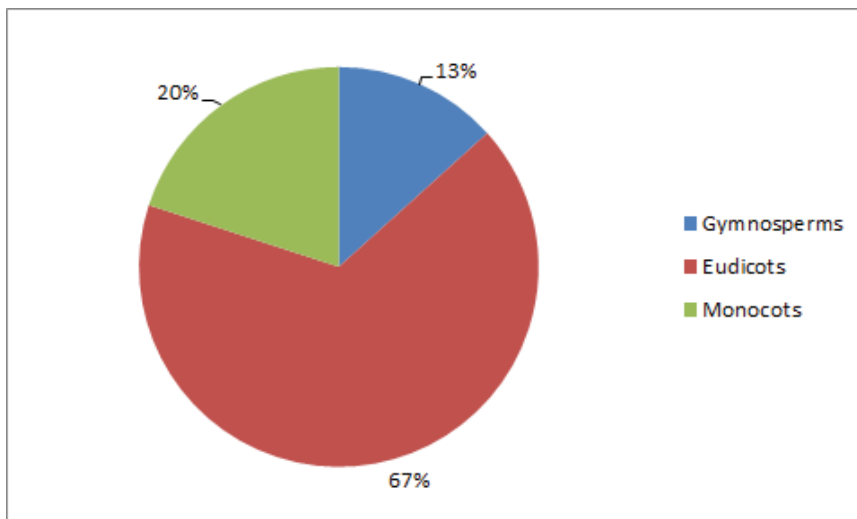


Figure 5. The composition of the flora by class.

Figure 6 shows that the plant group of the station is dominated by 46% phanerophytes and 40% chamaephytes with the presence of a few 7% hemicryptophytes and 7% geophytes and follows the following pattern: Ph>Ch>He = Ge.

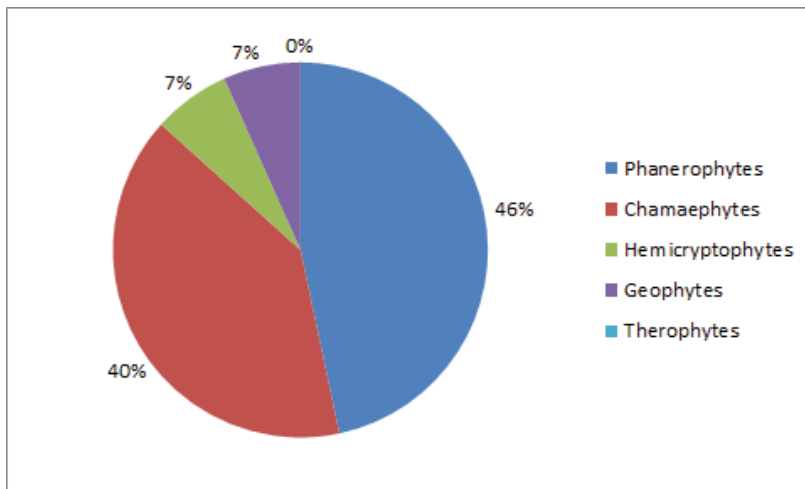


Figure 6. Percentage of different biological types.

Figure 7 reveals that the study area is represented by 60% ligneous perennials and 40% perennial herbaceous plants, observing the absence of annual herbaceous plants and this following the high temperatures experienced by the study station during the summer season.

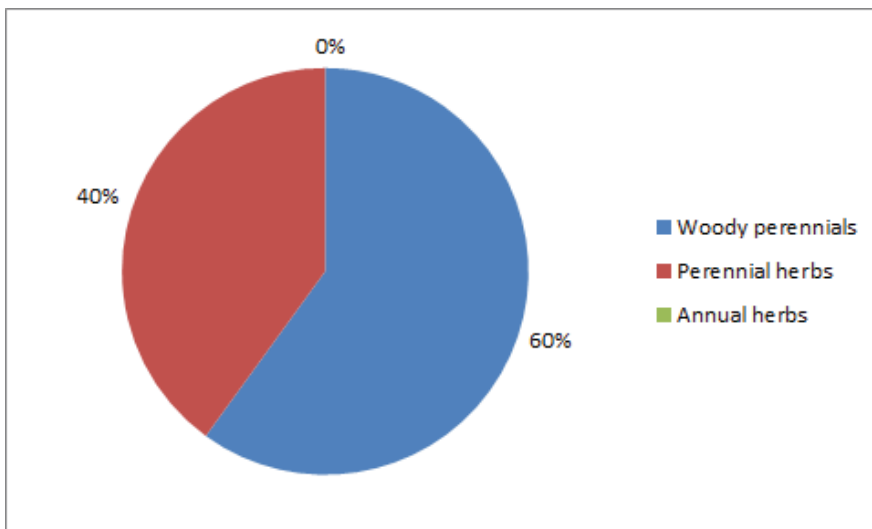


Figure 7. Percentage of different morphological types.

Figure 8 reveals that our station is characterized by the Mediterranean 40% and West-Mediterranean 33% biogeographical type with the presence of some other biogeographical elements (Ibero-Mauritanian, European-Mediterranean, Cosmopolitan).

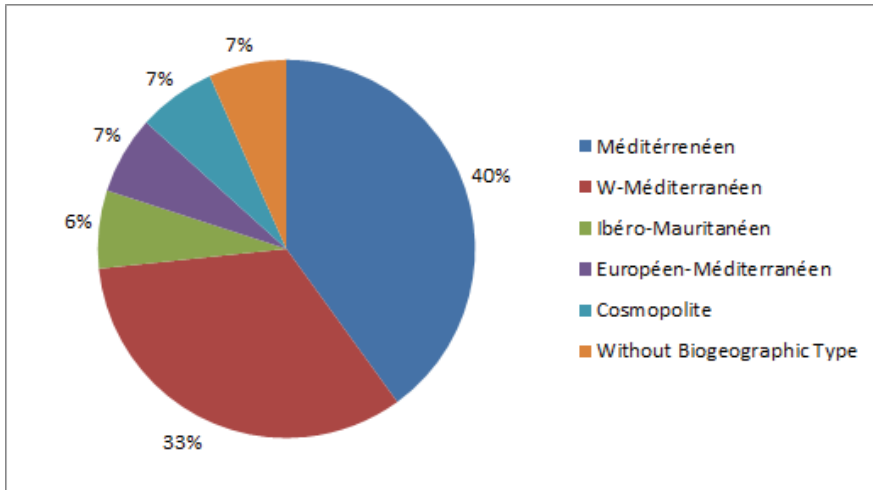
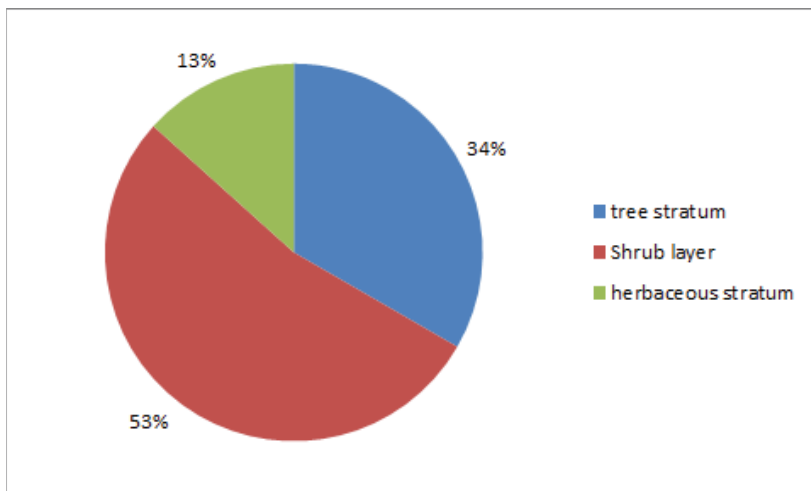


Figure 8. Percentage of different biogeographical types.

Figure 9 shows that the study area is dominated by the tree stratum 34% and shrubby 53% with a low rate of the herbaceous stratum 13%.



3.4. Phytodiversity according to the degree of flammability

The autumn season was chosen in order to know the state of the vegetation vis-à-vis forest fires after the high temperatures of the summer season.

Table 1 : The degree of flammability of the plant species at the study station.

Genus/Species	Degree of flammability
<i>Calicotome intermedia</i>	3
<i>Ampelodesma mauritanicus</i>	3
<i>Ulex parviflorus</i>	3
<i>Quercus suber</i>	3
<i>Daphne gnidium</i>	2
<i>Asparagus acutifolius</i>	
<i>Pinus halepensis</i>	3
<i>Lonicera implexa</i>	3
<i>Cistus ladaniferus</i> subsp. <i>africanus</i>	3
<i>Eryngium tricuspidatum</i>	
<i>Chamaerops humilis</i>	2
<i>Phillyrea angustifolia</i>	
<i>Crataegus oxyacantha</i>	3
<i>Marrubium vulgare</i>	
<i>Pistacia lentiscus</i>	

3 : extremely flammable ; 2 : moderately flammable ; 1 : low flammability.

The study area is defined by 54% of extremely flammable plant species which represents degree 3, 13% of moderately flammable plant taxa which represents degree 2 with the absence of low flammable plants and 33% of plant subjects without degree of flammability (Table 1 and Figure 10).

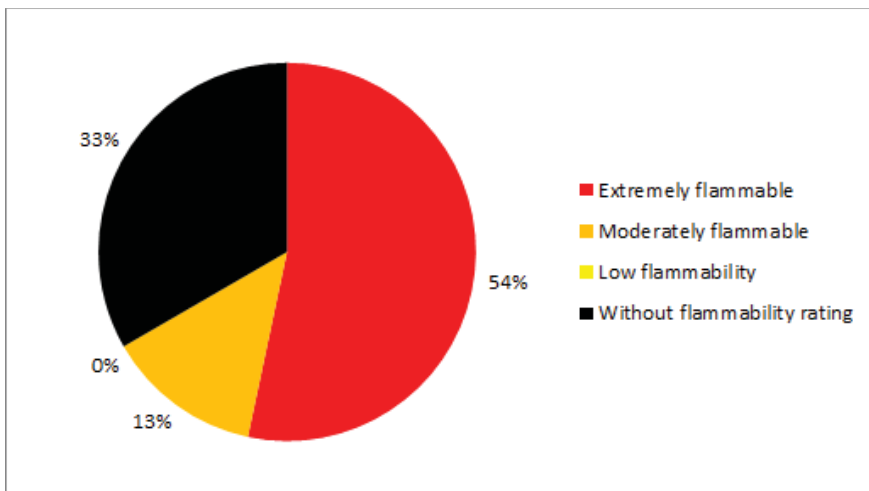


Figure 10. Percentage of Flammability.

4. CONCLUSION

During the autumn season, the Zarifet forest remains colonized by 60% woody perennials and 40% herbaceous perennials which represent the tree and shrub stratum which survived the high temperatures of the summer season. It is characterized by a degraded plant formation of *Quercus suber* invaded by *cistus ladanifer*, a species characteristic of the succession of regressive vegetation after fire, where the majority of taxa that are sensitive to forest fires. Reasoned management by foresters results in the establishment of fuel breaks (Rigolot, 2000 and Colin et al., 2001).

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