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THE STUDY GROUPS TO *PISTACHIA LENTISQUE* PHYTOECOLOGIQUE IN ALGERIA: CASE OF THE FOREST OF TAMEDRARA IN CHLEF

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ABSTRACT

This work is devoted to the study of a Pistachier Lentisque group for the Tamedrara forest; it is an integral part of the Tell Atlas mountains located south of the wilaya of Chlef. It is an original study carried out by a phytoecological approach whose plant formations encountered offered a great diversity. To give the state of the plant cover currently existing in this forest, results were obtained in the taxonomic, biological, morphological and biogeographical aspects. The floristic inventory counts 66 species, divided into 51 genera and 25 families generally represented by Asteraceae, Fabaceae, Lamiaceae, Poaceae and Liliaceae. The recorded observations allow us an area degraded by free grazing, repeated fires and ecotourism and therefore requires a program of forestry interventions in order to preserve this phytogenetic heritage at the level of the Tamedrara forest.

Keywords **:** Lentisk pistachio tree, phytoecology, plant diversity, Tamedrara canton, Chlef forest.

Introduction

In the world, the forest is an important natural resource, it provides the three essential functions: economic, ecological and social. The Mediterranean region is home to a biological diversity of prime importance through plant species that constitute local genetic resources with pastoral, fodder, food, aromatic and medicinal values. The particular geographical position of Algeria in the Mediterranean region has made a great diversity of biotope occupied by an important floristic richness.

In this study, our work focuses on mastic tree groups (*Pistacia lentiscus* L.), which are spontaneous species growing throughout the Mediterranean basin. *Pistacia lentiscus* L. is a shrub belonging to the Anacardiaceae family (Gaussen *et al*. 1982), of Asian or Mediterranean origin, commonly found in sub-humid, semi-arid and arid sites all around the Mediterranean (Verdŭ and García-Fayos, 2002 in Fetnassi T (2019).

It is a medicinal species that grows on any type of soil in sub-humid and semi-arid Algeria. It has been used since ancient times in traditional medicine and justified by its richness in chemical components with an aromatic smell such as essential oils, flavonoids, tannins (Hamlat and Hassani, 2008).

From our bibliographic research, we found that several authors are interested in studying this species for its medicinal, pharmaceutical, chemical compounds and economic usefulness (Benhammou *et al*., 2008; Castola *et al*., 2000; Djerrou *et al*., 2011; Duru *et al*., 2003; Janakat and Al-Merie 2002; Magiatis *et al*., 1999; Saadoun, 2002), so some authors are interested in the ecology and geographical distribution of this species (Alyafi, 1979; Belhadj, 2000; Benmehdi, 2003).

Our work here is mainly based on the phytoecological aspects of these formations and the various floristic processions of this species in the forest of Tamedrara located in the wilaya of chlef in the north - west of Algeria and this by the interpretation of the floristic diversity through morphological, biological and biogeographical type.

Material and Methods

Presentation of the study area

The Tamedrara forest is located in the Ouarsenis massif (Atlas Tellien) in the northwest of Algeria (Fig. n°1) It is part of the municipality of Sendjas, Daira de chelif, and extends over an area of 2854 Hectares spread over the following cantons: Baten el Bagra, Oued Ghadia, Ain Teskra, Tamedrara, Ain Tamda, Taleat Arrar, as well as the cantons of Trizin El Talba and Rokba Sidi Daoud in the Wilaya of Tissemsilt (conservation of the Forest of chlef).

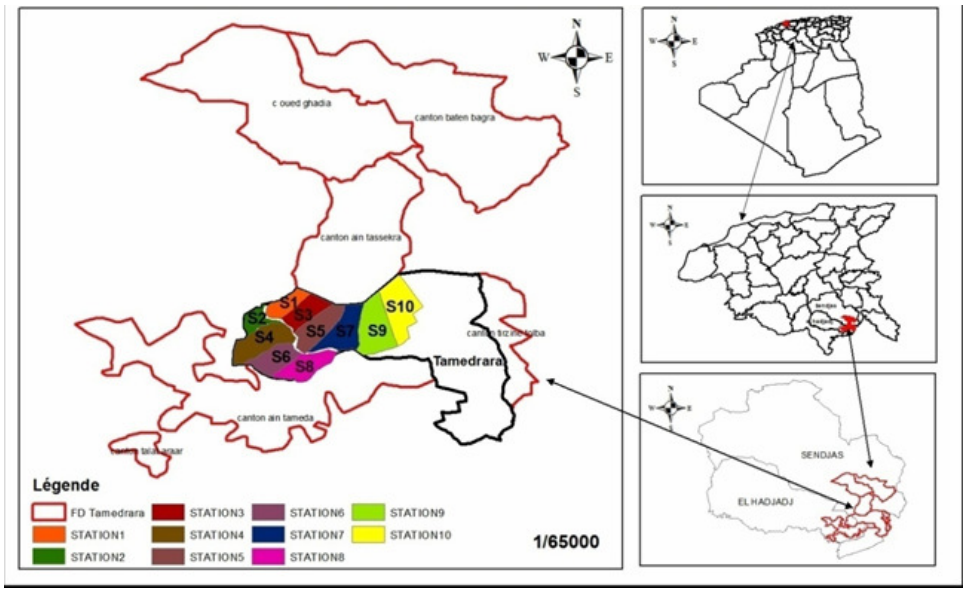

Fig. 1 : : Geographical location of study area

The geographical floor is of the middle Cretaceous represented by clay-limestone soil, with a soil of fairly good quality from a chemical point of view and constantly covered with forest or herbaceous vegetation. The altitude is varied between 800 m and 1194 m. The climate is characterized by an annual rainfall of 283.97 varied between 3.12 in July and 38.16 in December and a temperature varied between 11.22 in December and 31.48 in August Rainfall station of SidiYakoub (1987-2013). The most widespread vegetation adapted to the soil and climate in the eastern zone: Barbary arborvitae, Holm oak, Aleppo pine, Pinion pine, Zeen oak; we also find: olive, oxycedral juniper, lentisk, cistus of Montpellier and lavender.

Methodology adopted

A first field trip was made to take a general idea of the study area, and then the work was started in the field at the beginning of spring of the year 2018 because flowering is considered optimal for most species in this season. Inside the study area we have chosen the canton of Tamedrara (Fig. n°2), it is well represented by the *Pistachia lentiscus*.

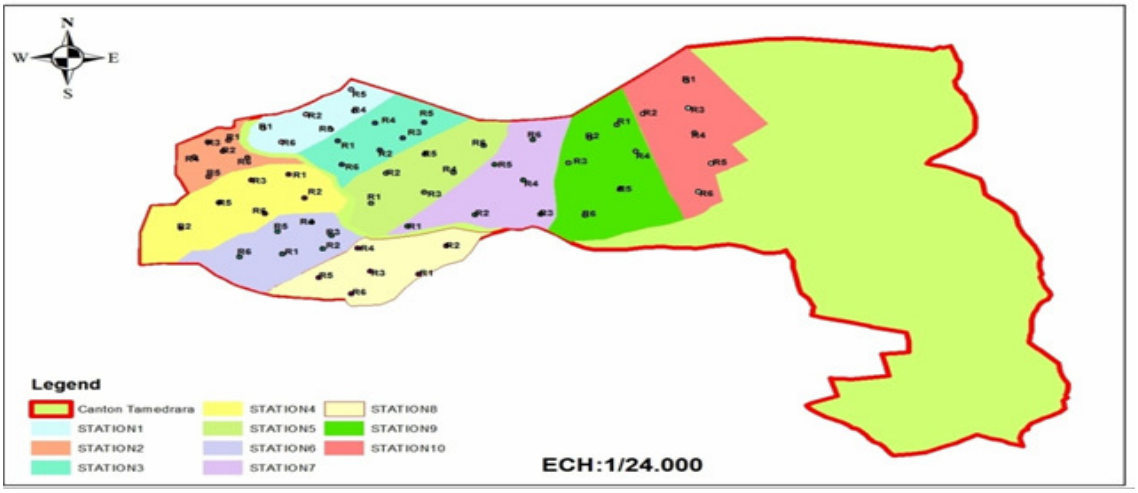

Fig. 2 : Map of sampling stations in the *Pistacia lentiscus* Study area Tamedrara Township (Tamedrara forest)

For all ecological studies based on field surveys, sampling is the first phase of the work and all the rest depends on it (Gounot, 1969 and Daget, 1989) and all available information can be used for station selection, representing the possible sample, in terms of their diversity, originality and representativeness (Gillet, 2000).

For the representativeness of the species, it is necessary to use an area at least above the minimum area, in the Mediterranean region this minimum area is of the order of 100 to 400 m² for forests and 50 to 100 m² for matorrals (Benabid, 1994).It is then based on the analysis of the spatial variations of the structure and the floristic composition, and that of the local ecological conditions in a uniform sectoral ecological context (Lepart and Escarre, 1983).

To do the sampling, 10 stations were chosen, each of these stations includes ecological characteristics measured in the field: area, geographical coordinates, height, topography (slope and exposure), (Table 1). The choice of surveys is based on a subjective sampling that takes into account the structure of the vegetation where the criterion of floristico-ecological homogeneity has been privileged.

The readings were made on floristically homogeneous surfaces, and 60 readings are made in the canton of Tamedrara with 6 readings for each station (Figure n°2)

Table 1 : The deferent data from the stations in the study area

Station	Area (Ha)	Geographic Coordinate		Height	Slope (%)	Exposure
		X	Y	Z (M)		
Station 1	19.3	362434.61	3983525.12	770	3/26	West
Station 2	14.4	361891.16	3983218.33	567	40/18	West
Station 3	26.4	362659.33	3983316.61	816	40/13	West
Station 4	42.9	362016.00	3982809.97	652	1/28	South-West
Station 5	36.3	362949.43	3983133.98	842	6/50	South-West
Station 6	30.3	362234.68	3982446.22	593	1/34	South-West
Station 7	39.3	363352.00	3982959.46	916	9/48	South
Station 8	33.2	362665.31	3982275.40	661	1/40	South
Station 9	51	363787.67	3983115.93	975	1/50	South
Station 10	51.5	364168.91	3983389.43	923	4/48	South East

The sampling equipment used includes: a digital camera to show the photos of species and the stations studied, secateurs to section the specimens of the species, an auger to take soil samples, Plaster and cord to delimit the sampling area, a GPS to take the geographical coordinates of the stations, a notebook and a pencil for recording the data, bags to collect the specimens and tape to fix the labels.

Vegetation on the one hand, it plays an important role in the evolution of a soil and on the other hand, it reveals certain edaphic, climatic and biotic ecological conditions (Aubert, 1983); it is for this reason, we have analyzed the main soil parameters to know the type and nature of the soil where this vegetation is distributed (CE, PH and MO) because the soil is the main element of the environment which regulates the distribution vegetation (Ozenda, 1954).

Result and Discussion

1. Result of analysis of some soil parameters

The results obtained are shown in the tables below.

Table 2: Result of physic- chemical analysis of Tamedrara Township

Station	(pH)	CE (uc)	MO	% C
Station 1	7,46	57,10	4,14	2,40
Station 2	**7,50**	62,40	3,72	2,16
Station 3	7,27	72,10	**6,21**	**3,60**
Station 4	6,60	82,20	2,07	1,20
Station 5	6,71	90,10	4,14	2,40
Station 6	7,02	70,20	2,76	1,60
Station 7	6,70	**102,00**	3,10	1,80
Station 8	**6,13**	94,30	3,28	1,90
Station 9	7,28,	**53,80**	**1,24**	**0,72**
Station 10	7,40	59,80	1,45	0,84

We see that stations 1, 2, 3.6, 9 and 10 are slightly alkaline and the other four stations 4, 5.7 and 8 have slightly acidic hydrogen (PH) potential. The electrical conductivity (EC) varies between 53.8 and 102 us; this shows that all the study stations reveal non-saline soils. The organic matter (OM) varies between 1.24 and 6.21 with a carbon content varied between 0.72 and 3.60%. This shows that all the study stations reveal soils with high organic matter.

These physico-chemical characteristics of the samples analyzed indicate fertile soils rich in organic matter thanks to the diversity of species and the distribution of the root system which thus show a very low conductivity and a neutral PH. These results indicate that *Pistacia lentiscus* does not present strict requirements on the soil side and shows a well-marked favorable dynamics in these stations.

II. Biological and biogeographical diversity

1. Systematic composition

According to the floristic inventories that were carried out in the selected stations, our study area includes 25 families, 51 genera and 66 species over an area of 344.6 ha.

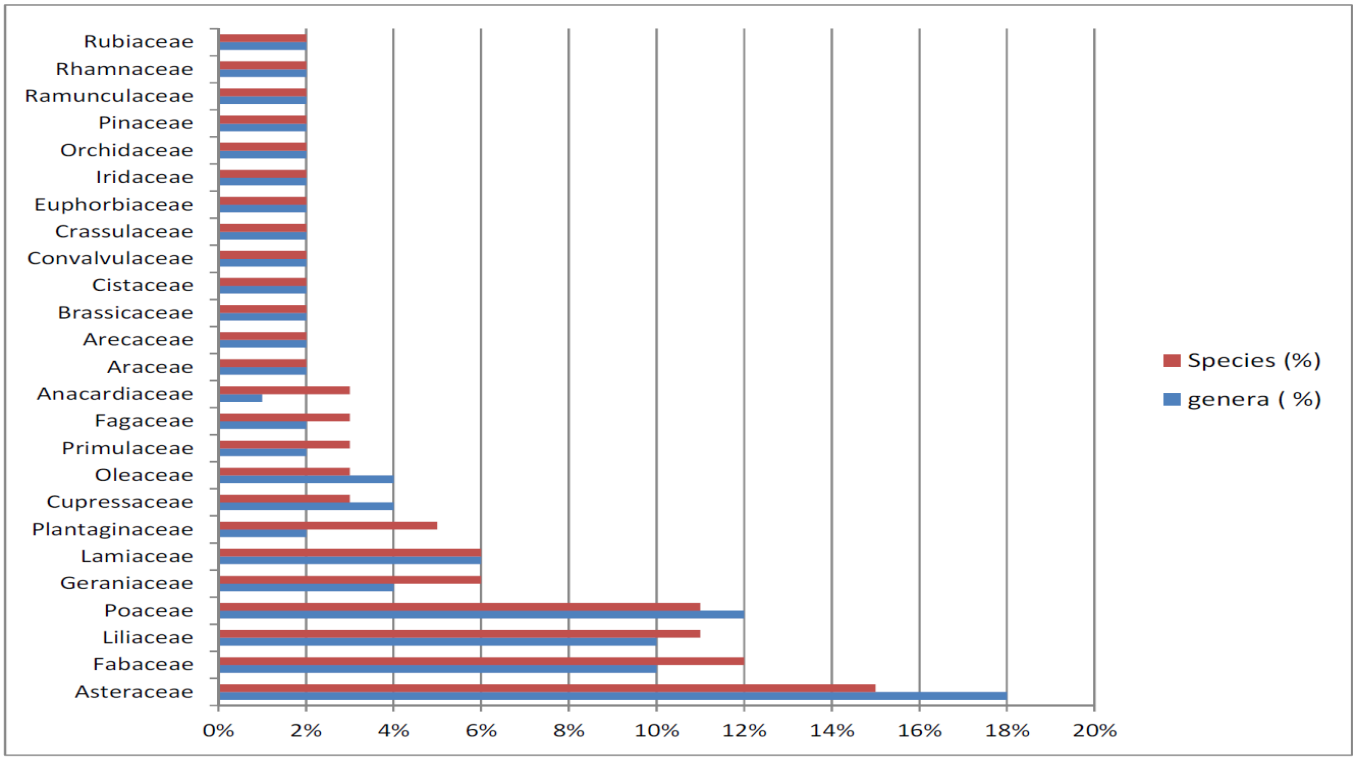

Fig. 3 : Composition in families, genera and species of the study area expressed in %.

These results indicate that the canton of Temedrara is characterized by a floristic procession comprising 25 families, dominated by Asteraceae with 15%, Fabaceae with 12%, Poaceae and Liliaceae with 11%, the other families have a low representation. Most genera are represented by only one, two or three species.

2. Biological Characterization

2.1. Biological classification of plants

The biological spectrum according to Gaussen *et al.* (1982) is the percentage of the various biological types. Through this study and according to the total list of identified species, we have retained five biological types and we can determine the percentage of each biological type. This result shows a distribution of biological types in the plant formations of the study area as follows: PH> CH> TH> GE> HE. The phanerophytes present a very high rate with a percentage of (35%), which testifies to a forest zone. Among the species encountered, we have: *Pistascia lentiscus* L., *Tetraclinis articulata* and *Juniperus oxycedrus*. Despite the importance of phanerophytes, chamaephytes remain important in the plant formations of the study area with 25% of the total number. Among the species encountered, we have: *Chamaerops humilis*, *Ampelodes mauritanica* and *Phagnalon saxatile*.

Therophytes are encountered with 21%, their representativeness remains low compared to chamaephytes, knowing that the percentage of therophytes is generally high in the Mediterranean and between 25% and 50% for forest formations (Barbero, 1989). These therophytes are represented in the area with the following species: *Anagalis arrvensis*., *Biscutella didyma* and *Plantago serraria*. Geophytes with 13%, their representativeness remains very low compared to phanerophytes with the following species: *Urginea maritima*, *Asparagus officinalis*, *Allium nigrum*. Finally the hemicriptophytes with a very low percentage of 6% are represented with the following species: *Astragalus crustiatus*. *Silybum marianus.* This low presence rate can be explained by the low organic matter content (Bouazza and Benabadji, 2002)

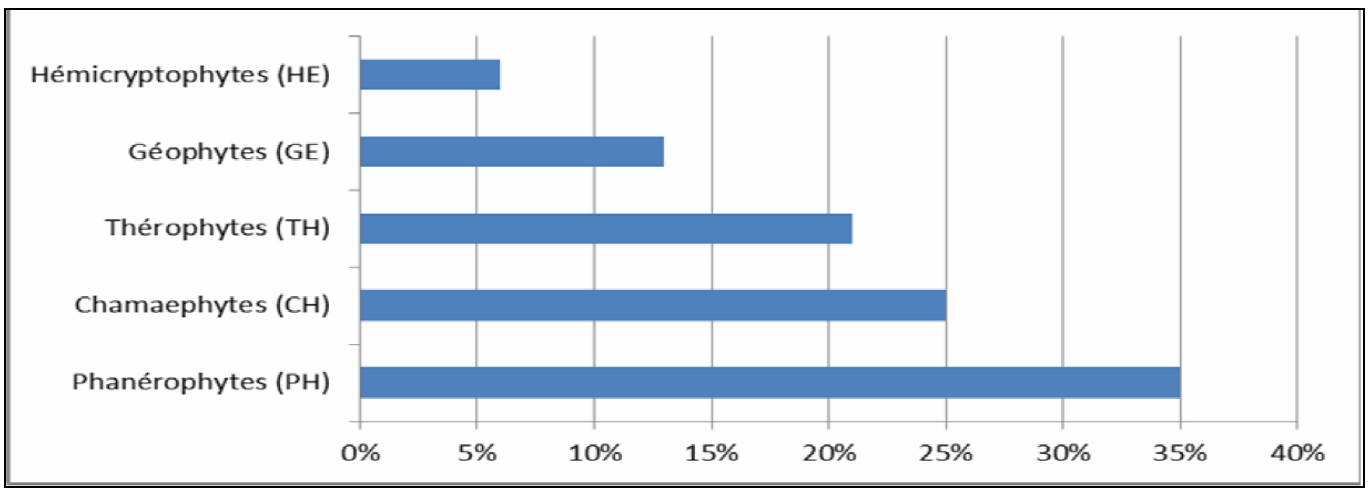

Fig. 4 : The biological types of the study area expressed in %.

2.2. Disturbance Index

The disturbance index allows us to quantify the therophytization of an environment (Loisel and Gamila, 1993). It is calculated according to:

$$IP = \frac{\text{Number of chamaephytes} + \text{Number of thérophytes}}{\text{Total number of species}}$$

This index was calculated for our study area (canton of Tamedrara) from the number of species identified for the 60 surveys carried out in the field, the disturbance index being around 46% for the area. This index allows us an area grazed by observed breeding practiced freely, in particular by cattle from the local population.

3. Morphological types

The shape of the plant is one of the basic criteria for the classification of species into morphological type, the phyto-mass is composed of perennial, woody or herbaceous species, and annual species, the number of species inventoried has been classified according to morphological types (Figure 5)

Droughts, fire, grazing, clearing and observed local ecotourism lead to a regressive evolution of the vegetation cover in the study area. This regression results in the invasion of annual herbaceous plants with a short life cycle; they express an adaptation strategy vis-à-vis unfavorable conditions and a form of resistance to climatic rigors, justified by significant natural regeneration each year.

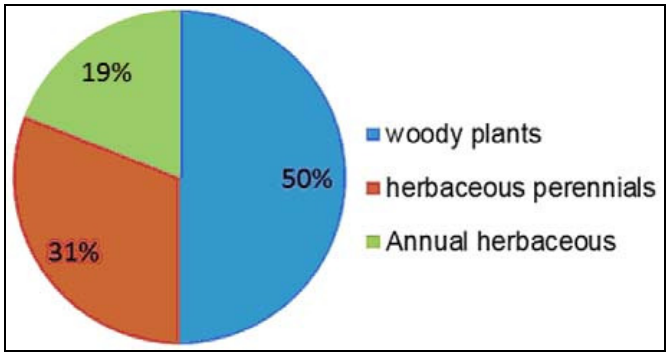

Fig. 5 : The morphological types of the study area expressed in %.

4. Biogeographic types

The biogeographical analysis of the current flora is likely to provide valuable information on the modalities of their establishment in the study region and the biogeographical spectrum, established according to the total floristic list of the territory, highlights the various elements. Among the species present in the Tamedrara forest, several have a significant range. To study this distribution of species we are based on the information provided by the new flora of Algeria Quezel and Santa (1962-1963).

The analysis of the flora shows a predominance of Mediterranean biogeographic type species in the study area with a percentage of 45%, then the West Mediterranean type by 17%. The rest represents a low participation, but contribute to the diversity and richness of the plant genetic potential of the region.

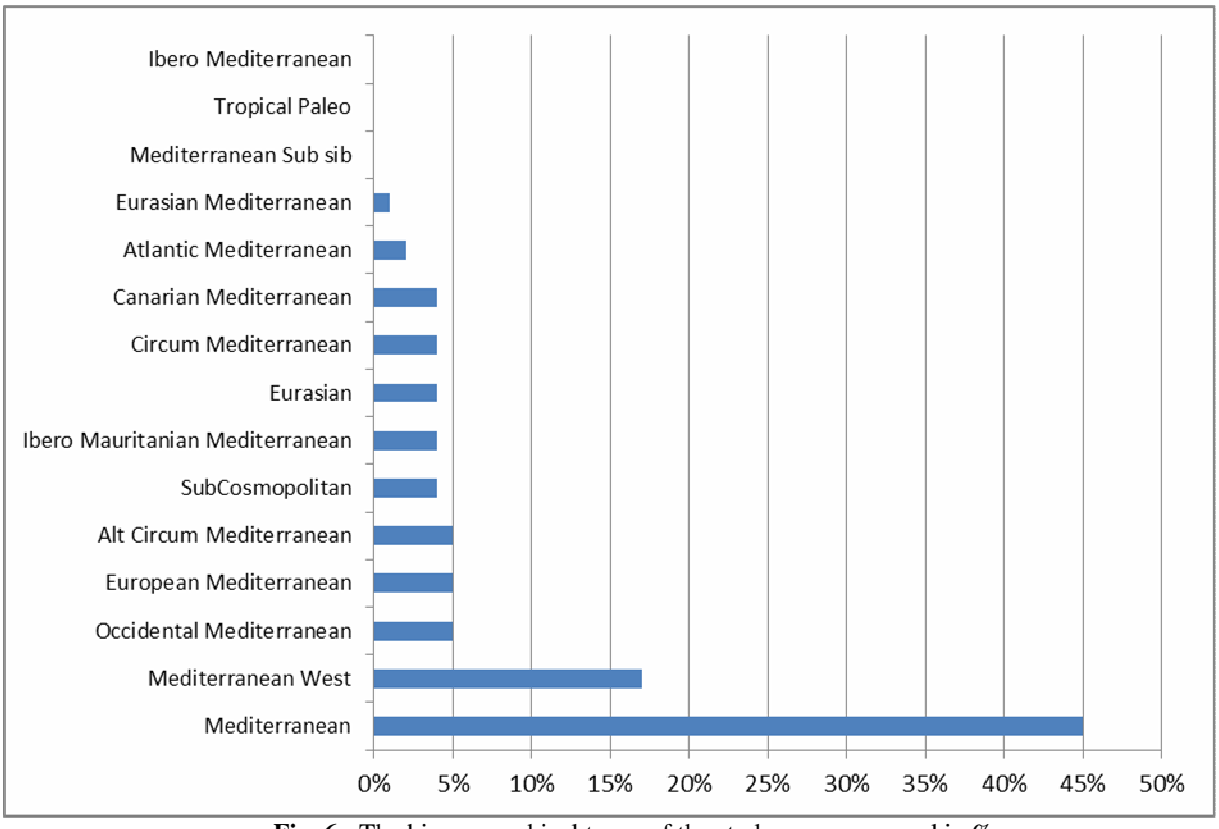

Fig. 6 : The biogeographical types of the study area expressed in %.

Conclusion

For this research, the Tamedrara forest in the wilaya of Chlef was chosen as a model for a phytoecological study of Pistachio Lentisk groups, because this important species in the region. According to the floristic inventory of selected stations, our research area covering an area of 344.6 hectares, includes 66 species, 51 genera and 25 families. The most

represented families of this plant formation are that of Asteraceae with 15%, Fabaceae with 12%, Poaceae and Liliaceae with 11%.From a morphological point of view, woody perennials represent 50%, herbaceous perennials 31% and herbaceous annuals with 19%.The analysis of the phytogeographical distribution shows the predominance of Mediterranean species with 45% then the West Mediterranean type with 17%.Studies of biological types have shown that phanerophytes are the most abundant with (35%) of the total population, which testifies to a forest zone. The chamaephytes keep a particularly important place with 25%, then the Therophytes with 21% and of lesser importance the Geophytes with 13% and the hemicriptophytes with 6%.

The disturbance index for the study area (46%) indicates an area grazed by livestock, degradation also due to repeated fires and climate change leads to the disruption of ecological balances. It is therefore necessary to program forestry interventions in order to preserve this phytogenetic heritage at the level of the Tamedrara forest.

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