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# Phytodiversity of the communities with *Tetraclinis articulata* (Vahl) Mast. (Pinales Cupressaceae) in the Dahra region (Chlef, Algeria)

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**ABSTRACT** This work was carried out at the Dahra forest in the north-west of the wilaya of Chlef in western Algeria, to give the state of the vegetation cover and in particular that of the groups to *Tetraclinis articulata* (Vahl) Mast. (Pinales Cupressaceae) currently existing in this region. The floristic inventory includes more than 74 taxa, divided into 32 families, that belong to the Mediterranean biogeographic type with a percentage of 48%, next to the high rate of taxa of the whole Mediterranean develop endemic species and Eurasian elements. From the biological point of view chamephytes have an important place in the plant groups in Thuya followed by Therophytes, Phanerophytes, Hemicryptophytes and Geophysicists. Herbaceous plants are the most dominant with a percentage of 68%, followed by perennials with 32%. We were also able to describe a list of the so-called faithful species of *Tetraclinis articulata* or the species that make up the groups of the latter.

**KEY WORDS** *Tetraclinis articulata;* floristic; forest; Dahra; eastern Algeria.

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## INTRODUCTION

Barbary thuja, *Tetraclinis articulata* (Vahl) Mast. (Pinales Cupressaceae), is endemic to North Africa, and in particular from Maghreb countries (Morocco, Algeria and Tunisia). Quezel & Santa (1962-1963) have mentioned that thuja is very common in the Orania sector (O1-O2-O3) and forms the backstory of vegetation (Hadjadj, 1995).

The forest and pre-forest ecosystems of the study area are currently undergoing major changes. One of the key questions that is being raised is understanding how and to what extent plant biodiversity contributes to the stability of the ecosystem and its functions.

Knowledge, classification, characterization and conservation of different taxa are a global scientific priority for biodiversity assessment and management (Cotterill, 1995). Efforts to study flora are very important in understanding plant's major biological traits and their biogeographical distribution (Lavergne et al., 2005).

Our study focuses on the thuja groups of Berberia (*Tetraclinis articulata*) in the Dahra forest. It is based on the phytoecological, biological, physiological and biogeographical aspects of these formations with an inventory of vegetation, which constitute the groups in thuja based on a stratified sampling.

## MATERIAL AND METHOD

### *Study area*

The study region located in the far north-west, 70 km from the central headquarters of the wilaya of Chlef, bordered to the west by the commune of

Ouled Boughalem (wilaya of Mostaganem), and to the east by the municipality of Taougrite and in the north by the Mediterranean Sea and the commune of Marsa and to the south by the commune of Sidi M'hamed Ben Ali or Renou (wilaya of Relizane).

It is located on a large part of the Dahra Mountains, contains natural properties that have the same characteristics of high plains such as Algiers and Oran (Fig. 1).

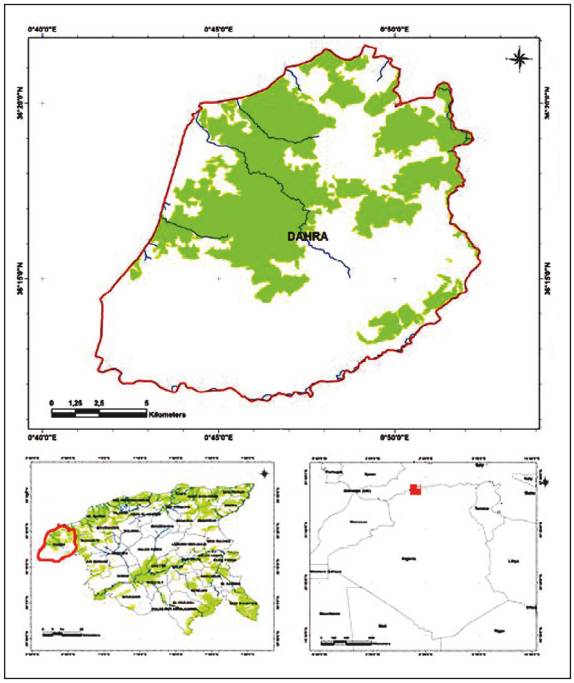


Figure 1. Location of the study area.

### *Data collection and sampling*

Usually (see also Dagnelie, 1970 and Guinochet, 1973), sampling is the operation that takes a number of elements that can be observed or processed.

According to Braaun-Blanquet & Pavillard, 1928) cited by (Gillet, 2000), the minimum area is the minimum space that an individual of association requires to acquire the development to which the normal specific set corresponds, on the other hand the minimum area, according to Djebaili (1984), varies according to each plant grouping.

It is now accepted that in the Mediterranean region, the survey area varies from 100 to 400 m$^2$ in the forest, and from 50 to 100 m$^2$ in the matorrals (Benabid, 1984). Hadjadj Aoual (1995) limited the minimum area for matorrals to thuja of the Oran to 100 m$^2$.

In the interior of the Dahra region, the area of 100 m$^2$ looks sufficiently representative of the minimum area. The choice of surveys carried out is guided by the presence of formations at *Tetraclinis articulata*, which is the subject of our study, in a way respecting the criterion of floristic and ecological structural homogeneity (Gehu & Rivas-Martinez, 1981; Gehu, 1982).

Within the study area we carried out 60 floristic surveys during the period of optimal vegetation from March to June during the year 2019.

Vegetation analysis based on the relative frequencies of each species inventoried appears to be the most appropriate analytical character for this type of research.

The frequency of each species reflects the regularity of its distribution in a plant community.

It is expressed by the following formula:

$$F(\%) = 100 \times \frac{n}{N}$$

n: the number of records where the species exists.
N: the total number of surveys conducted.

Durietz (1920) proposed 5 classes:
- Class 1: very rare species; 0 F – 20%
- Class 2: rare species; 20 F – 40%
- Class 3: frequent species; 40 F – 60%
- Class 4: abundant species; 60 F – 80%
- Class 5: very constant species; 80 F – 100%

The botanical determination of species is carried out using the works of Quezel & Santa (1962-1963), Dobignard & Chatelain (2010-2013), Sterry (2006) and Barey et al. (2004).

## RESULTS

According to the analysis and identification of the floristic procession of stands at *Tetraclinis articulata* in the Dahra forest, the flora (Fig. 2) is dominated mainly by the families of the Asteraceae and Lamiaceae (12%), which are the most cosmopolitan with 16 species, followed by the Cistaceae (7%) with 5 species, then in third place respectively the families of the Fabaceae, Apiaceae and Poaceae with 4 species, followed by the families of the Oleaceae, Cupressaceae Plantaginaceae (3 species). We also

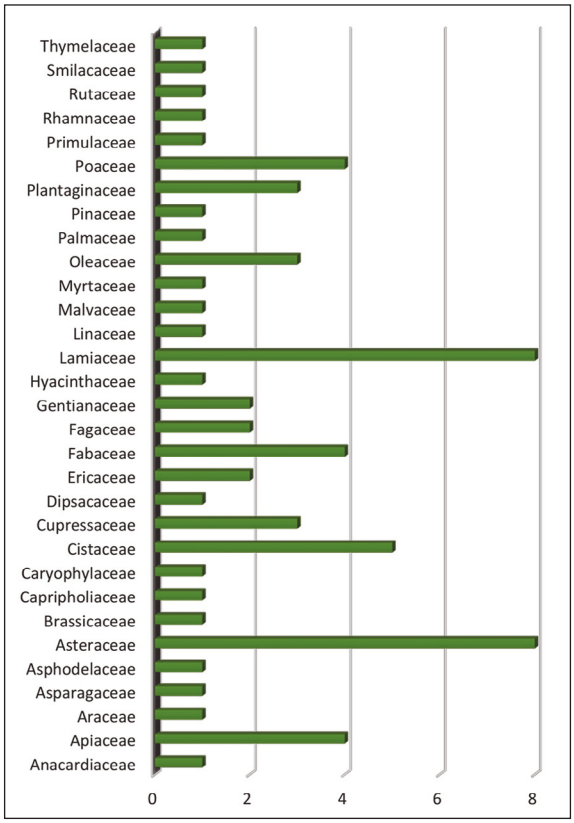


Figure 2. Composition of families in the study area.

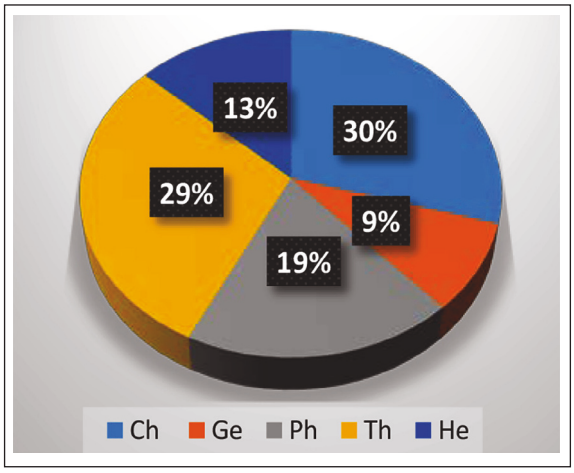


Figure 3. Biological types (%) in the study area.

witness the presence of families presented by 2 species such as: Ericaceae, Fagaceae and Gentianaceae; as well as families presented by 1 species such as: Araceae, Brassicaceae, Capripholiaceae, Caryophylaceae, Dipsacaceae, Malvaceae, Myrtaceae, Palmaceae, Asphodelaceae, Pinaceae Primulaceae, Linaceae, Thymelaceae, Smilacaceae, Rutaceae, Hyacinthaceae, Rhamnaceae, and Anacardiaceae.

The established biological distribution shows (Fig. 3) a predominance of Chamaephytes (Ch) in the study area with 30%. The proportions increase as soon as there is degradation of preforestal environments due to the Chamaephytes adapting better to summer drought and light (Anderson, 1988). The high frequency of these species is evidence of the openness of forest formations favoured by anthropozoogenal action (Alcaraz, 1991).

Therophytes (Th), with 29%, are essentially formed by *Anagalis arvensis*, *Bellis annua*, *Blackstonia perfoliata*, *Briza maxima*, *Bromus ruben*, *Centaurium erythraea*, *Evax argentea*, *Lobularia maritima*, *Scabiosa maritima*, and *Lagurus ovatus*.

This therophytic dominance is due to the periods of repeated droughts (between 6 and 8 months in the year) that have marked these mountain ranges as they are best suited to extreme conditions (Negre, 1966).

Phanerophytes (Ph) are present with 19%, Hemicryptophytes (He) with 13% and Geophysicists (Ge) with 9%. The very low proportion of geophysicists is related to a climate that favours the development of short-cycle species (Aidoud, 1983).

Therefore, the vegetation in the study area follows the Ch>Th>Ph>Ge pattern.

From a morphological point of view, the plant formations of the study area are marked by heterogeneity between woody and herbaceous, and between perennials and annuals.

At the study area level, we observed that herbaceous plants either annual or perennial dominate with 59% (Ha+Hv), with perennials woody coming second with 41% (Lv) (Fig. 4).

Zohary (1974) was the first to draw the attention of phytogeographs to the heterogeneity of the origins of the Mediterranean flora on different species by biogeographical element that remains heterogeneous (Fig. 5).

Mediterranean chorotype is the most represented in the study region (48%). This chorotype is closely followed by the western Mediterranean species (12%) and the Euro-Mediterranean species. Euro-Asian elements make up 5% with 3 species, while endemic species are only 2. The cosmopolitan element comes first with 3 species. In second place we have the Paleo-sub-tropical and Iberian-Mauritanian comprising 2 species.

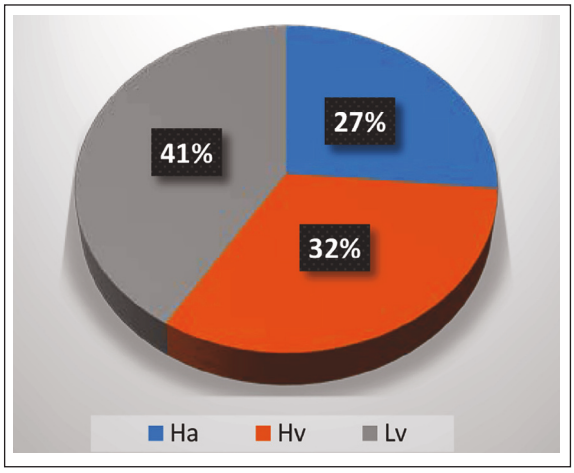


Figure 4. Percentage of morphological types in the study area.

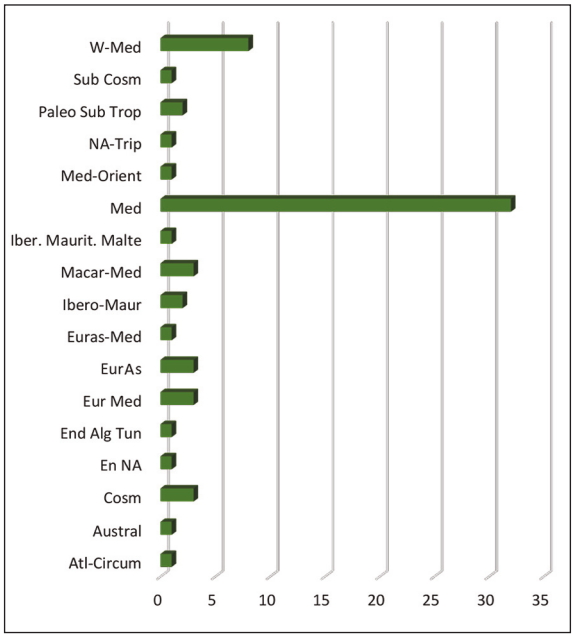


Figure 5. Biogeographic types in the study area.

The criterion of fidelity has the same form as the traditional criterion; it is a relative frequency (Brisse et al 1995). A constant species is defined by a high relative frequency level and it is present in more than 60% of all surveys (Gillet, 2000).

After the analysis of the selection of the species inventoried, we obtained the list of species faithful to *Tetraclinis articulata* or the plant species that make up the groups in thuja: *Pistacia lentiscus*, *Cistus monspeliensis*, *Ampelodesma mauritanica*, *Calicotome spinosa*, *Phillyrea angustifolia*, *Erica arborea*, *Quercus coccifera*, *Arisarium vulgare*

## CONCLUSIONS

The forests of Dahra, part of the far west of Chlef, were chosen as a model for a contribution to the study of groups at *Tetraclinis articulata*, because this species dominates the region and is characterized by its resistance to degradation conditions.

From the vegetation point of view, the flora of the study area includes 31 families, 59 genera composed mainly by species belonging to the families of the Lamiaceae, Ateraceae, Cistaceae, Poaceae and Apiaceae. The groups a *Tetraclinis articulata*, marked by a dominance of the Chamaephytes, followed by the Therophytes then the Phanerophytes, Hemicophytes and Geophysicists. From the morphological point of view, the plant formations are marked by a heterogeneity between woody and herbaceous and between perennials and annuals. In terms of phytogeographic, the distribution of species shows a dominance of Mediterranean species in the study area with a percentage of 48%.

Due to the various factors of degradation including fires, the presence of *Tetraclinis articulata* in the study area has decreased and the pace of the forest is constantly modified and transformed into more or less dense matorrals. This study is therefore mainly guided by the hope of contributing to the conservation and restoration of vegetation in the Dahra Mountains.

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