



FLORISTIC CHARACTERIZATION OF MEDICINAL PLANTS USED IN RURAL COMMUNITIES (NORTH EASTERN DAHRA MOUNTAINS, ALGERIA)

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Abstract

The main objective of this study was to gather information about the botanical characteristics, the importance and the floristic diversity of the medicinal plants used in a south Mediterranean area, the Northeastern Dahra Mountains in Chlef, Algeria.

The results revealed a total of 70 medicinal species distributed over 38 botanical families. Botanically, the most dominant families were the Lamiaceae (14.3%), Asteraceae (13%) and Apiaceae (5.7%), the vast majority of these species were phanerophytes (30%), perennial woody plants, and of Mediterranean vegetation type. The results of this survey were indeed a valuable source of information about the medicinal plants used in an important Mediterranean area. As a consequence, chemical and pharmacological studies are highly recommended for the promotion and preservation of these valuable species.

Key words : Medicinal plants, diversity, botanical characteristics, traditional medicine, Dahra Mountains, Algeria.

Introduction

Several studies highlight the importance of herbal medicine among indigenous peoples in different parts of the world and especially the developing countries (Tabuti *et al.*, 2003; Kujawska *et al.*, 2017) such as the ethnopharmacological and ethnobotanical surveys conducted in Africa (Rakotonandrasana *et al.*, 2017), India (Bhaskar, 2018) and Iraq (Hassoon *et al.*, 2018).

As a Mediterranean country, Algeria is considered a real phylogenetic reservoir known by its floristic diversity and richness. Thus, many ethnopharmacological surveys have been conducted in various regions throughout the country, in order to document and preserve the indigenous traditional medicine knowledge (Boudjelal *et al.*, 2013; Benarba *et al.*, 2015; Ouelbani *et al.*, 2016; Bouasla and Bouasla, 2017 and Miara *et al.*, 2018). Unfortunately most of these surveys focused only on the therapeutic use of

spontaneous species while neglecting the floristic aspect of these species (Hammiche and Gueyouche, 1988, Hamel *et al.*, 2018).

In this context, the present study aims to collect information about the floristic diversity and richness of the main medicinal plants used in the treatment of various diseases by the local population of Dahra Mountains in the state of Chlef (Algeria), in order to provide the basic information and an overview into the importance of medicinal plants.

Materials and Methods

Study area and population

The study area is a coastal Mediterranean ecosystem, located in the eastern part of Dahra Mountain in the state of Chlef, extending between 1°12'56.9" and 1°42'4.1" of East longitude and between 36°18'9.5" and 36°33'26.7" of North latitude in the Western part of Algeria (fig. 1). It

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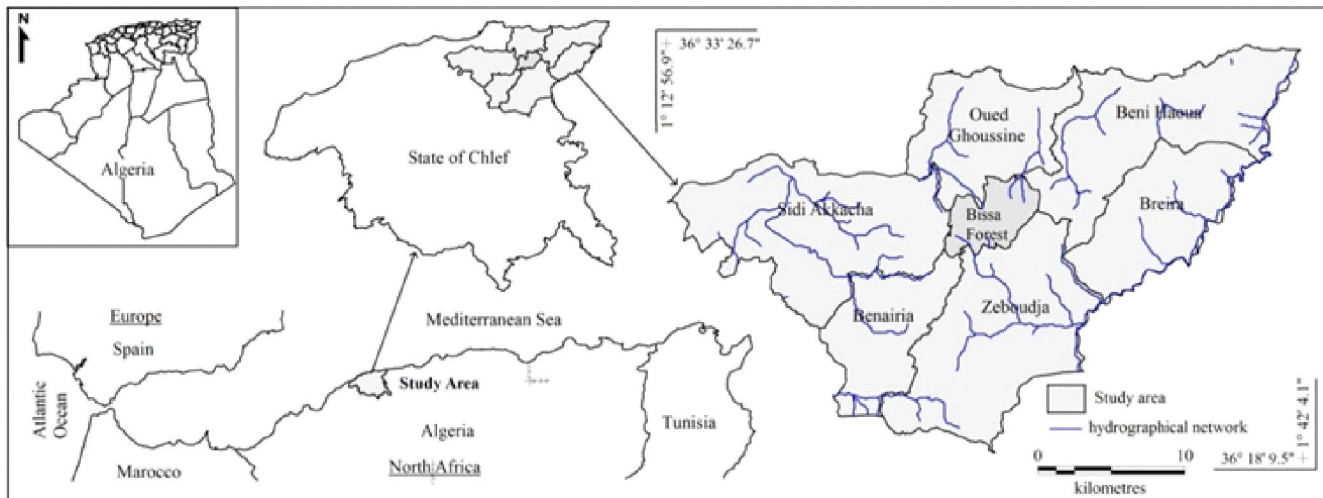


Fig. 1 : Location of the study area.

is a highly-developed forest ecosystem with a typical Mediterranean climate and a rugged topography, the altitude varies from 400 m to 1146 m.

This region is inhabited by rural population the majority of the dwellers are farmers who still continue to practice traditional medicine.

Data collection

The investigation of medicinal plants used within the communities of Zebboudj, BeniHaoua, Benairia and Berra and the surrounding areas was carried out between the years 2016 and 2018.

A questionnaire was administered to the local population, the information were collected through face to face interviews. The interviews were carried out during the area's busy hours in public spaces such as markets, mosques, cafeterias and also at homes (Akerreta *et al.*, 2007).

Plant materials

The collected species were dried and placed into herbaria, the species identification was done by botanists based on Quezel and Santa (1962, 1963). The identification was then updated in terms of systematic, nomenclature and chorology using the North African database index (Dobignard and Chatelain, 2010-2013).

Species data

In order to understand the evolutionary aspects and the functional differences within vegetation types, the species were grouped in terms of families, plant strata, biological types and biogeographical types according to the Flora of Algeria (Quezel and Santa, 1962, 1963).

Results and Discussion

Floristic composition

A total of 70 medicinal species belonging to 38 botanical families were identified throughout the study area (fig. 2), the most represented families were the Lamiaceae with 14.29% of the total flora (10 species) followed by Asteraceae (12.9%) and Apiaceae with 5.7% (4 species). These results were similar to several ethnobotanical studies conducted in Algeria, indeed according to Boudjelal *et al.* (2013), Benarba *et al.* (2015), Ouelbani *et al.* (2016), Bouasla and Bouasla (2017), Miara *et al.* (2018), Hamel *et al.* (2018), Lamiaceae, Asteraceae and Apiaceae were the most dominant medicinal families in all the investigated areas throughout Algeria.

Biological characterization

According to the biological spectrum, Phanerophytes were the most dominant biological type among the medicinal species recorded in the study area, followed by Chamephytes and Hemicriptophytes whereas Therophytes were the least represented (fig. 3), the overall distribution was as follow: Ph>Ch> He>Ge> Th.

The Phanerophytes with a percentage of 30% of the total biological types were mainly represented by:

- *Myrtus communis* L.
- *Tetraclinis articulata* (Vahl) Mast.
- *Quercus ilex* L.
- *Pistacia lentiscus* L.
- *Olea europaea* L.
- *Eucalyptus globulus* L. abill.
- *Arbutus unedo* L.

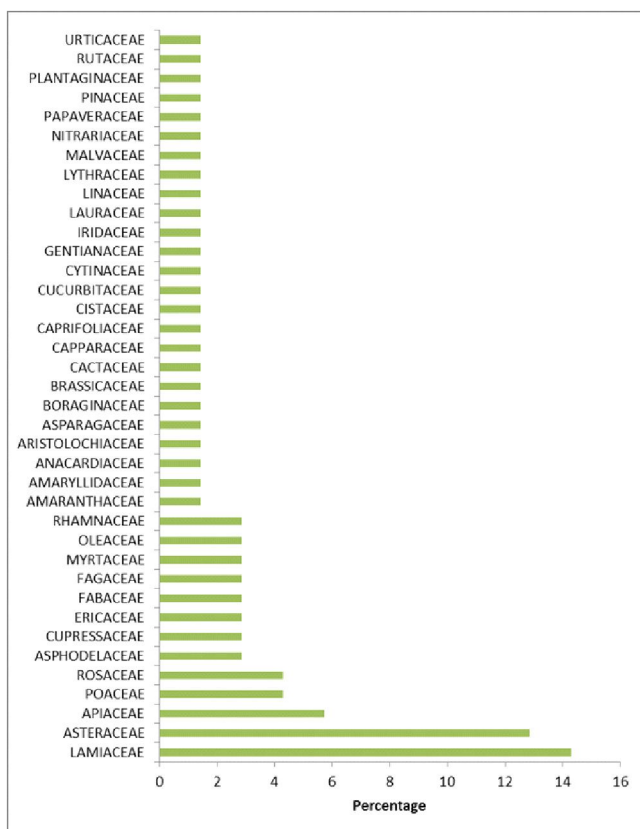


Fig. 2 : Botanical families identified and used in traditional medicine in the study area.

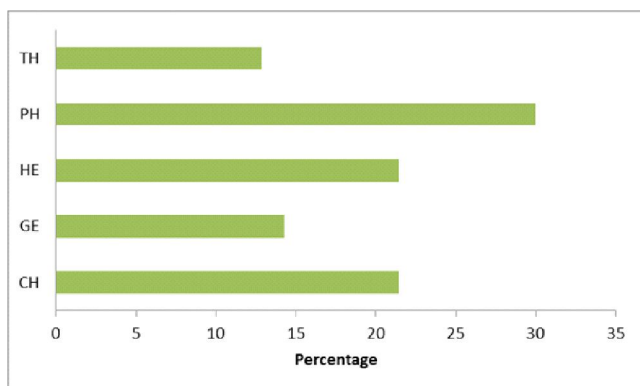


Fig. 3 : Most dominant biological types of medicinal plants used in the study area.

- *Crataegus oxyacantha* L.

The Chamaephytes, with 21.4%, were more common in the shrubs (Dahmani, 1996) and were represented by:

- *Rhamnus alaternus* L.
- *Globularia alypum* L.
- *Peganum harmala* L.
- *Cistus monspeliensis* L.
- *Lavandula stoechas* L.
- *Rosmarinus officinalis* L.

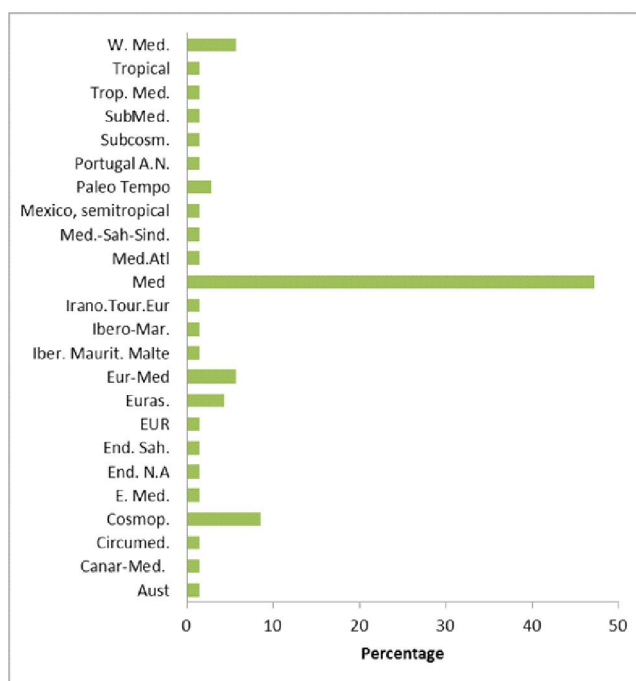


Fig. 4 : Most dominant phyto-geographical type of medicinal plants used in the study area.

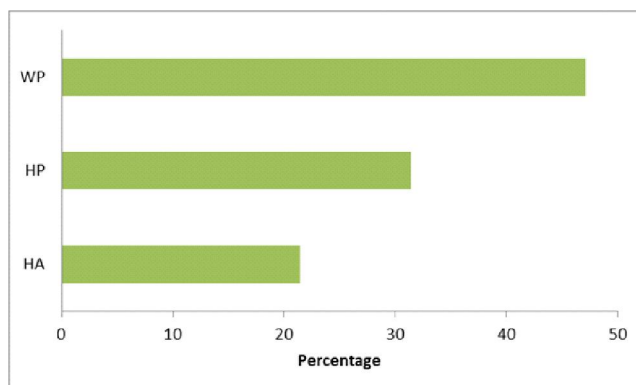


Fig. 5 : Most dominant morphological types of medicinal plants used in the study area.

- *Salvia officinalis* L.
- *Rubus ulmifolius* Schott.

The same percentage of 21.4% was shown by Hemicryptophytes, this biological type was represented by:

- *Ajuga iva* L.
- *Malva sylvestris* L.
- *Marrubium vulgare* L.
- *Mentha pulegium* L.
- *Borago officinalis* L.
- *Clinopodium nepeta* L.
- *Nepeta multibracteata* Desf.
- *Thymus vulgaris* L.

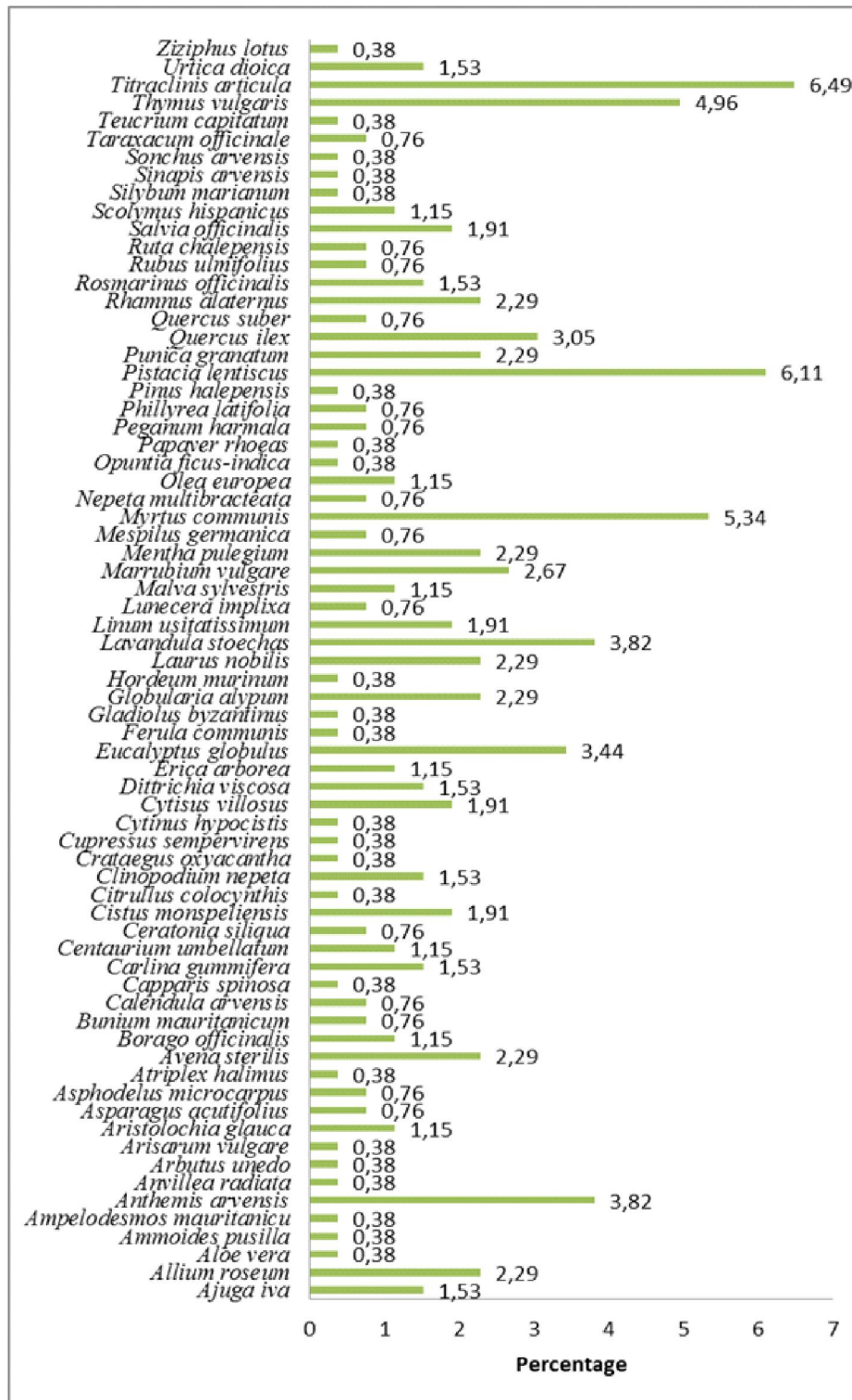


Fig. 6 : Medicinal plants use frequencies (%).

The geophytes were less represented with only 12%. They are represented by:

- *Asphodelus ramosus* L.
- *Aristolochia baetica* L.

Finally, the therophytes were the least represented

with only 9%, they were represented by:

- *Calendula arvensis* L.
- *Anthemis arvensis* L.
- *Papaver rhoeas* L.

The dominance of Phanerophytes was mainly due

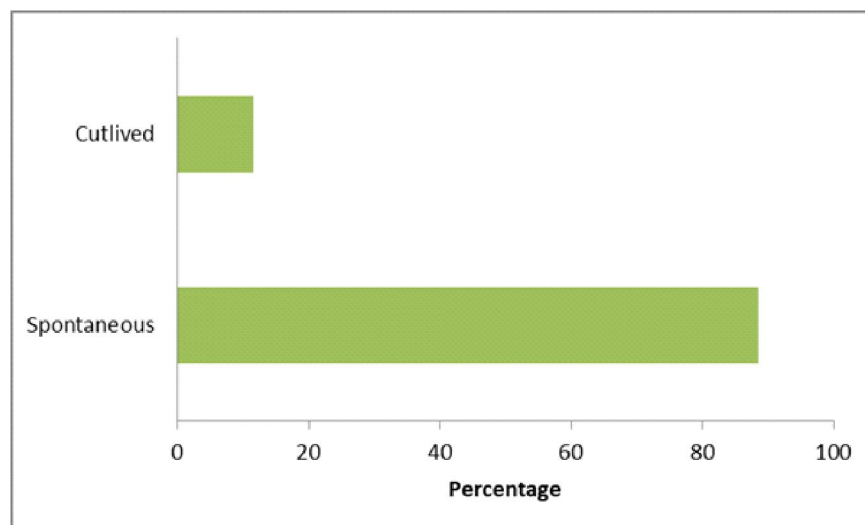


Fig. 7 : Type of species used as medicinal plants in the study area.

their perennial nature (forest, scrub, garrigue and matorral) throughout the year. Indeed, according to Belhacini *et al.* (2017), such results reflect perfectly the forestry nature of a given area.

Phyto-geographical characterization

The geographical nature and the ecological conditions prevailing in the study area were very favorable to the appearance of the Mediterranean flora. Indeed the results showed the predominance of the Mediterranean vegetation types with a total of 33 species and a percentage of 47.1% of all the medicinal plants used across the study area. The Cosmopolitan vegetation types showed also a significant presence in the area with 8.57% (6 species) of the total bio-geographical types, the West-Mediterranean and Euro-Mediterranean types accounted for almost 5% (fig. 4).

The endemic species used in traditional medicine showed a percentage of 2.86% of the total identified flora, one of which, namely *Bunium bulbocastanum* (Apiaceae) is only encountered in North Africa and a second species namely *Anvillea radiata* (Asteraceae) is only found in the north African desert.

The same finding concerning the dominance of the Mediterranean vegetation types was reported by several studies conducted in Algeria, indeed the chorological analysis conducted by Chermat and Gharzouli (2015), showed an abundance of Mediterranean vegetation types with a very small proportion of endemic species used in traditional medicine.

Morphological characterization

Morphologically, the plant formations characterizing the study area were remarked by a significant heterogeneity

between ligneous and herbaceous plants, and between perennial and seasonal species.

According to the results, the perennial woody plants were the most dominant with a percentage of 41.1%. The perennial herbaceous plants were also significantly used in traditional medicine with a proportion of 31.4% and finally annual herbaceous plants represented 21.4% of all the traditional medicine species (fig. 5). The common use of herbaceous and woody medicinal species has also been reported in other parts of the world, indeed because of their worldwide availability, the traditional healers focus mainly on herbs and trees in traditional medicine (Uniyal *et al.*, 2006; Sanz-Biset *et al.*, 2009; Parthiban *et al.*, 2016).

Most used species

Among the 38 families identified throughout the study area, 70 species were described by the local population as medicinal plants (fig. 6), among which 32 species (45.7%) were also described as being medicinal species by the local population of Edough Peninsula in Northeastern Algeria according to Hamel *et al.* (2018).

The most frequently cited species according to the local population were as follows: *Tetraclinis articulata* (6.49%), *Pistacia lentiscus* (6.11%), *Myrtus communis* (5.34%), *Thymus vulgaris* (4.96%), *Anthemis arvensis* (3.82%), *Lavandula stoechas* (3.82%), *Eucalyptus globulus* (3.44%), *Quercus ilex* (3.05%) and *Marrubium vulgare* (2.67%). These findings were very concordant with those reported by several studies carried out throughout Algeria (Boudjelal *et al.*, 2013; Benarba *et al.*, 2015; Ouelbani *et al.*, 2016; Bouasla and Bouasla, 2017 and Miara *et al.*, 2018; Hamel *et al.*, 2018). The dominant use of these specific species resides in the

familiarity of the local population with these taxa and in their long reputation passed between generations, as very effective in the treatment of different and numerous diseases.

However, the intensive use of these biological resources may threaten their very existence and consequently the biological diversity in the study area, as 88.6% of the medicinal species used by the local population were spontaneous, while only 11.4% were cultivated (fig. 7). It is therefore necessary to take protective measures against uncontrolled pickings in order to preserve and ensure the viability of these precious natural resources (Bouasla and Bouasla, 2017).

Conclusion

The Northeastern Dahra Mountains constitutes a large reservoir of medicinal plants. The most dominant medicinal species used in the treatment of several diseases among the local population, belong mainly to the botanical families of Lamiaceae and Asteraceae and were phanerophytes, perennial woody plants and of Mediterranean vegetation type. As a consequence of the excessive use of these species, a conservation plan should be developed to protect these species and maintain the biological diversity in the mounts of Dahra. The valorization of medicinal plants may certainly contribute to the well-being and good health of the local population in the study area, accordingly, it is necessary to carry out chemical and pharmacological research on all the cited plants, in addition, implementing a global conservation strategy may protect these precious species.

Acknowledgments

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- East Mediterranean; End. N.A: Endemic North Africa; End. Sah: Endemic Saharan; Eur: European; Euras: Eurasian; Eur-Med : European Mediterranean; Iber. Maurit. Malte : Ibero Mauritanian Malte ; Ibero-Mar : Ibero Mauritanian ; Irano.Tour.Eur : Irano-Touranien European ; Med: Mediterranean ; Med. Atl: Mediterranean-Atlantic; Med.-Sah-Sind: Mediterranean Sahara-Sindien ; Mexico, semitropical; Paleo Tempo : Paleo-tempered ; Portugal A.N : Portugal North-African; Sub.Cosm. Sub Cosmopolitan; Sub.Med: Mediterranean Sub; Trop. Med. Tropical Mediterranean; Trop: Tropical ;W. Med: Mediterranean West. He: hemicryptophyte, The: therophyte, Geo: geophyte, Ch: chameaphyte, Ph: phanerophyte.

Abbreviations

Aust: Australian; Canar-Med: Canarian Mediterranean; Circum. Med. Circumboreal Mediterranean; Cosmop: Cosmopolitan; E. Med: