

## Article de recherche

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# Ethno botanical study and inventory of medicinal plants in the steppe region of Ain-Skhouna (Saida-Algeria)

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## ملخص

على الرغم من تطور الكيمياء الاصطناعية، احتفظ استخدام النباتات الطبية بمكانة كبيرة بسبب فعاليتها في مختلف الإجراءات العلاجية. أتاحت الدراسة النباتية التي أجريت على مستوى بلدية عين السخونة وصف الاستخدامات المختلفة للنباتات الطبية من قبل السكان المحليين، فضلا عن تأثيرها على تدهور التنوع البيولوجي النباتي. المنطقة، التي غالبا ما تخضع لظروف مناخية صعبة، يسكنها سكان فقراء مع ارتفاع معدل الأمية. وتشكل هذه العوامل الأسباب الرئيسية للاستغلال المكثف للموارد، التي تشكل النباتات الطبية عنصرا أساسيا فيها. يكشف تحليل وثائق الدراسة الـ 309 عن 18 نوعا محلي، 27 نوعا خارج الإحصاء و 17 نوع مستورد معروف ومستخدم من قبل سكان المنطقة ويشير إلى أن الأوراق المغلية هي أجزاء النبات الأكثر استخداما في علاج اضطرابات الجهاز الهضمي والاضطرابات الأيضية والالتهابات التناسلية وكذلك الأمراض الجلدية. يمكن أن يؤدي استخدام الطب التقليدي إلى اختفاء الأنواع، ولذلك يصبح من الملح اعتماد نهج التنمية المستدامة للحفاظ على الموارد الطبيعية .

**كلمات مفتاحية:** السهوب، النباتات الطبية، دراسة نباتية، التدهور .

## Abstract

Despite the development of synthetic chemistry, the use of medicinal plants has retained a large place because of their effectiveness in various therapeutic procedures. The ethno botanical study carried out at the scale of the municipality of Ain Skhouna made it possible to describe the different uses of medicinal plants by the local population, as well as their impact on the degradation of plant biodiversity. The area, often subject to difficult climatic conditions, is occupied by a deprived population with a high illiteracy rate. These factors constitute the main causes of the intense exploitation of resources, of which medicinal plants are an essential component. The analysis of the 309 surveys reveals 18 inventoried species and 27 species outside (excluding studied facies) and 17 imported species known record and used by the inhabitants of the region and indicates that the leaves prepared in decoction are the parts of the plant most used in the treatment of digestive disorders and metabolic diseases, genital infections as well as skin conditions. The use of traditional medicine can lead to the disappearance of species. It is therefore urgent to adopt a sustainable management approach for the safeguarding and preservation of natural resource plants .

**Keywords:** Steppe, medicinal plants, ethnobotanical study, degradation.

## Résumé

Malgré le développement de la chimie de synthèse, l'utilisation des plantes médicinales a conservé une large place du fait de leur efficacité dans diverses procédures thérapeutiques. L'étude ethnobotanique réalisée à l'échelle de la commune de Ain Skhouna a permis de décrire les différentes utilisations des plantes médicinales par la population locale, ainsi que leur impact sur la dégradation de la biodiversité végétale. La zone, soumise à des conditions climatiques souvent difficiles, est occupée par une population démunie avec un taux d'analphabétisme. Ces facteurs constituent les principales causes de l'intense exploitation des ressources, dont les plantes médicinales sont une composante essentielle. L'analyse des 309 enquêtes fait apparaître 18 espèces inventoriées et 27 espèces hors du relevé (hors facies étudiés) et 17 espèces importées connu et utilisé par les habitants de la région et indique que les feuilles préparées en décoction sont les parties de la plante les plus utilisées dans le traitement de troubles digestifs et métaboliques, les infections génitales ainsi que des affections cutanées. Le recours à la médecine traditionnelle pouvant conduire à la disparition des espèces, Il devient donc urgent d'adopter une approche de gestion durable pour la sauvegarde et la préservation des plantes des ressources naturelles .

**Mots clés :** Steppe, plantes médicinales, étude ethnobotanique, dégradation.

## 1. Introduction

Medicinal plants play an essential role in traditional health systems, especially in regions where modern medical infrastructure is insufficient. According to the World Health Organization (WHO, 1993), more than 80% of African populations turn to traditional medicine and pharmacopeia. In developing countries, medicinal plants remain a primary source of medical care in the absence of modern health systems (Tabuti et al. 2003). Of the approximately 500,000 species of plants existing on Earth, about 80,000 possess medicinal properties (Quyoun, 2003).

Algeria, with its various climates (Mediterranean, arid) and its pedological diversity, is home to a flora rich in medicinal plants. These plant resources, distributed across the coasts, plains, mountains, steppe, Sahara and around water sources, are crucial for the Algerian economy and the preservation of the ecological balance.

The floristic richness of Algeria has been extensively documented by researchers such as Maire (1952) and Quezel and Santa (1962). The estimates of the number of species of Algerian flora range from 3,139 to 5,500 species, according to studies by botanists and ecologists. Among these species, more than 600 are recognized for their medicinal properties (Mokkadem, 1999). In Algeria, traditional medicine retains significant importance, particularly among rural populations where many diseases (digestive, respiratory, rheumatic, etc.) are treated by plants.

Ethnobotany, which studies the use of plants in the food, medicinal and artisanal fields, forms the core of this research. The main objective of this study is to inventory plant species with medicinal interest, evaluate their use and analyze their impact on the degradation of steppe plant formations in the region of Ain-Skhouna (Algeria). This region, characterized by a semi-arid climate and steppe flora, presents a plant cover dominated by several medicinal plants.

The ethnobotanical survey undertaken has two objectives: firstly, to conduct an inventory of medicinal plants used; secondly, to evaluate the impact of this use on the degradation of steppe plant formations.

## 2. Materials and Methods

### 2.1. Location and characteristics of the study area

The study area is located in the commune of Ain Skhouna (Figure 1), on the high steppe plains of the west, north of the eastern part of Chott echergui. It is bordered to the south by Rogassa (W. El Bayadh), to the east and north by the wilaya of Tiaret, and to the northwest by Maamoura (W. Saida). The commune covers an area of 250 km<sup>2</sup> and is located 60 km from the capital of the daïra of El Hassasna and 80 km from the capital of the wilaya of Saida.

The study area has distinct characteristics, including a Mediterranean climate that belongs to the fresh semi-arid bioclimatic stage, according to Djellouli (1981). The soils of the region are mostly saline with degraded plant covers. The substrate is composed of limestone crust and clayey, marly silts as well as red clay. The limestone soils, which dominate the surface of the area, show heterogeneity in terms of depth: there are deep soils (30 cm), medium-depth soils (15 to 30 cm), and shallow soils (15 cm). Soil texture varies from silty to sandy, with a silt content ranging from 35 to 48%, or from sandy-silty with 17 to 25% coarse sand. The pH of soils is basic, oscillating between 7.5 and 8.5, and soils are very rich in carbonate. The rate of humus is low,

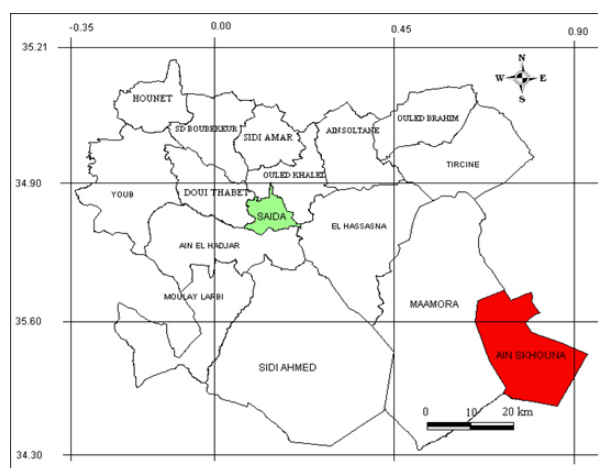


Figure 1. Location of the study area.

ranging between 0.5 and 1.3% organic matter, sometimes reaching 2.5% in alluvial deposits, according to [Djebaili \(1984\)](#).

Four floristic inventory stations were selected for this study:

- Station 1, located in Rjem el Ogab (N: 34.7165°; E: 000.56576°), is characterized by a steppe with *Stipa tenacissima*.
- Station 2, located at Guenatis Ghraba (N: 34.66051°; E: 000.62817°), is characterized by a steppe with *Artemisia herba alba*.
- Station 3, located at Oued Khrouf (N: 34.71634°; E: 000.56573°), is a steppe with *Lygum spartum*.
- Station 4, at Moulay Abdelkader (N: 34.61652°; E: 000.57576°), is dominated by halophytes.

## 2.2. Phytoecological characteristics

The phytoecological aspects of the study area, defined by the work of various researchers [Dubuis and Simonneau \(1957\)](#), [Le Houérou et al. \(1979\)](#), [Nedjraoui and Bedrani \(2008\)](#), [Djebaili et al. \(1989\)](#); [Moulay et al. \(2012\)](#), [Aidoud \(1983\)](#) and [Djellouli and Daget \(1988\)](#), reveal three main plant groupings. The first grouping, that of the high plains, includes associations with *Stipa tenacissima* and *Artemisia herba alba*. The second grouping, the Daïas, is subdivided into sub-associations with *Artemisia herba alba* and *Atriplex mauritanica*, as well as *Sueda fruticosa*. Finally, the third group, the coastline of the chott, is characterized by vegetation adapted to constantly humid areas, such as *Juncus maritimus*.

The region's economy is primarily based on agriculture and pastoralism. According to [DSA data \(2010\)](#), the livestock is mainly composed of sheep (96.57%), followed by cattle (1.82%), goats (1.45%) and camels (0.14%) ([DSA, 2010](#)).

## 2.3. Phytoecological surveys

To assess the floristic diversity, an inventory of vegetation is carried out in each site. A survey is considered representative if it is carried out over an area of at least 100 m<sup>2</sup> ([Djebaili, 1978](#)). The quadrat point technique ([Gounot, 1969](#)) is used to analyze the vegetation structure and soil surface characteristics of the Algerian steppe ([Aidoud,](#)

[1983](#); [Nedjraoui, 1990](#); [Slimani, 1998](#)).

## 2.4. Ethnobotanical survey

Common species are recognized in the field, and unidentified species are collected or photographed for laboratory identification. The flora of [Quezel & Santa \(1962\)](#) and [Maire \(1952\)](#) as well as various guides to medicinal plants are used for identification. Ethnobotanical surveys are conducted in the form of discussions with local residents aged 20 to over 79 years, using questionnaires on the use of plants, their harvest, preparation, administration and treated diseases.

## 3. Results and Interpretation

### 3.1. Floristic surveys

A survey of the population of Ain Skhouna identified 62 species, 18 of which could be sampled in the field. The rarity of some species is due to overexploitation, highlighting the importance of the relationship between humans and plant species. Some of these species possess pharmacological properties that give them medicinal value ([Table 1](#)).

Analysis of [Table 1](#) reveals a difference in the distribution of species. The Halophyte facies includes species absent in the other three facies studied. Of the 18 medicinal species, 61.11% are found in the steppes with Alfa, *Artemisia herba alba* and Sparta, while 38.88% are present in the wet zone (halophyte steppe) ([Figure 2](#)).

### 3.2. Ethnobotanical study

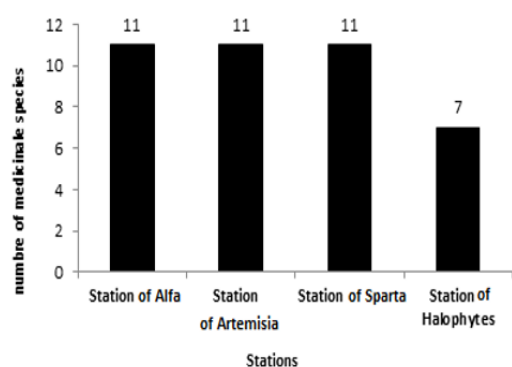
The total population of Ain Skhouna is estimated at 8391 inhabitants ([ONS, 2015](#)), with 45.5% unemployed and 54.5% employed. These conditions contribute to extreme poverty, intensifying the pressures on steppe formations. The inhabitants are often forced to resort to traditional medicine due to the high costs of modern medicine.

The frequency of use of medicinal plants varies according to age, intellectual level and sex. A total of 309 survey forms were completed and analyzed ([Table 2](#)). Statistical analysis (multiple correspondence analysis) reveals three distinct groups:

- 1st group: Individuals of both sexes, illiterate, in the age group over 79 years.

**Table 1.** Medicinal plants found in floristic surveys (+ presence. - absence).

| Famillies       | species                                   | Facies of            |      |        |            |
|-----------------|-------------------------------------------|----------------------|------|--------|------------|
|                 |                                           | <i>A. herba alba</i> | Alfa | sparta | Halophytes |
| Aspleniaceae    | <i>Phyllitis scolopendrium</i> (L.) Newm. | -                    | -    | -      | +          |
| Asteraceae      | <i>Artemisia herba alba.</i>              | +                    | +    | +      | -          |
|                 | <i>Scorzonera undulate</i> Vahl.          | -                    | -    | -      | +          |
| Brassicaceae    | <i>Eruca vesicaria</i> , (L.) Car.        | +                    | +    | +      | -          |
| Caryophyllaceae | <i>Herniaria hirsuta</i> , L.             | +                    | +    | +      | -          |
|                 | <i>Spergularia salina</i> Presl.          | +                    | +    | +      | -          |
| Chenopodiaceae  | <i>Atriplex halimus</i> , L.              | -                    | -    | -      | +          |
|                 | <i>Arthrocnemum fruticosum</i>            | -                    | -    | -      | +          |
|                 | <i>Sueda fruticosa</i> , L.               | -                    | -    | -      | +          |
|                 | <i>Sueda maritima</i> (L.) Dumort.        | -                    | -    | -      | +          |
| Cistaceae       | <i>Helianthemum pilosum</i> (L.) Pers.    | +                    | +    | +      | -          |
| Fabaceae        | <i>Astragalus armatus</i> . Willd.        | +                    | +    | +      | -          |
|                 | <i>Astragalus sesameus</i> L.             | +                    | +    | +      | -          |
| Juncaceae       | <i>Juncus maritimus</i> Lamk.             | -                    | -    | -      | +          |
| Lamiaceae       | <i>Marrubium vulgare</i> L.               | +                    | +    | +      | -          |
| Poaceae         | <i>Lygeum spartum</i> , L.                | +                    | +    | +      | -          |
|                 | <i>Stipa tenacissima</i> L.               | +                    | +    | +      | -          |
| Zygophyllaceae  | <i>Peganum harmala</i> L.                 | +                    | +    | +      | -          |

**Figure 2.** Representation of medicinal species in different stations.

• 2nd group: Individuals of both sexes with a medium level of education.

• 3rd group: Women in the 36-46, 47-57 and 58-68 age groups with a secondary education level.

Older people use medicinal plants more, often due to poverty and traditional beliefs (Figure 3).

**By age group:** The age group that uses medicinal plants the most is over 79 years old (18.12%), followed by the 69-79 and 36-46 age groups (17.15%), then the 47-57 and 58-68 age groups (15.85% and 16.82% respectively). The 20-35 age group uses medicinal plants the least (14.88%) (Figure 4).

**By sex:** Women have slightly higher knowledge of medicinal species compared to men (50.81% vs

**Table 2.** Frequency of use of medicinal plants according to the profile of the respondents.

|              | Men   |       |       | Women |       |       | Total   |
|--------------|-------|-------|-------|-------|-------|-------|---------|
|              | *NL   | ML    | SL    | NL    | ML    | SL    |         |
| <b>Age</b>   |       |       |       |       |       |       |         |
| 20-35        | 8/10  | 4/10  | 10/10 | 10/10 | 5/10  | 9/10  | 46/60   |
| 36-46        | 10/10 | 8/10  | 10/10 | 10/10 | 7/10  | 8/10  | 53/60   |
| 47-57        | 10/10 | 7/10  | 8/10  | 10/10 | 6/10  | 8/10  | 49/60   |
| 58-68        | 9/10  | 7/10  | 10/10 | 10/10 | 6/10  | 10/10 | 52/60   |
| 69-79        | 9/10  | 7/10  | 8/10  | 10/10 | 10/10 | 9/10  | 53/60   |
| +79          | 10/10 | 8/10  | 9/10  | 10/10 | 10/10 | 9/10  | 56/60   |
| <b>Total</b> | 56/60 | 41/60 | 55/60 | 60/60 | 44/60 | 53/60 | 309/360 |

\* Level of education : **NL**: No level; **ML**: Medium level; **SL**: Secondary level.

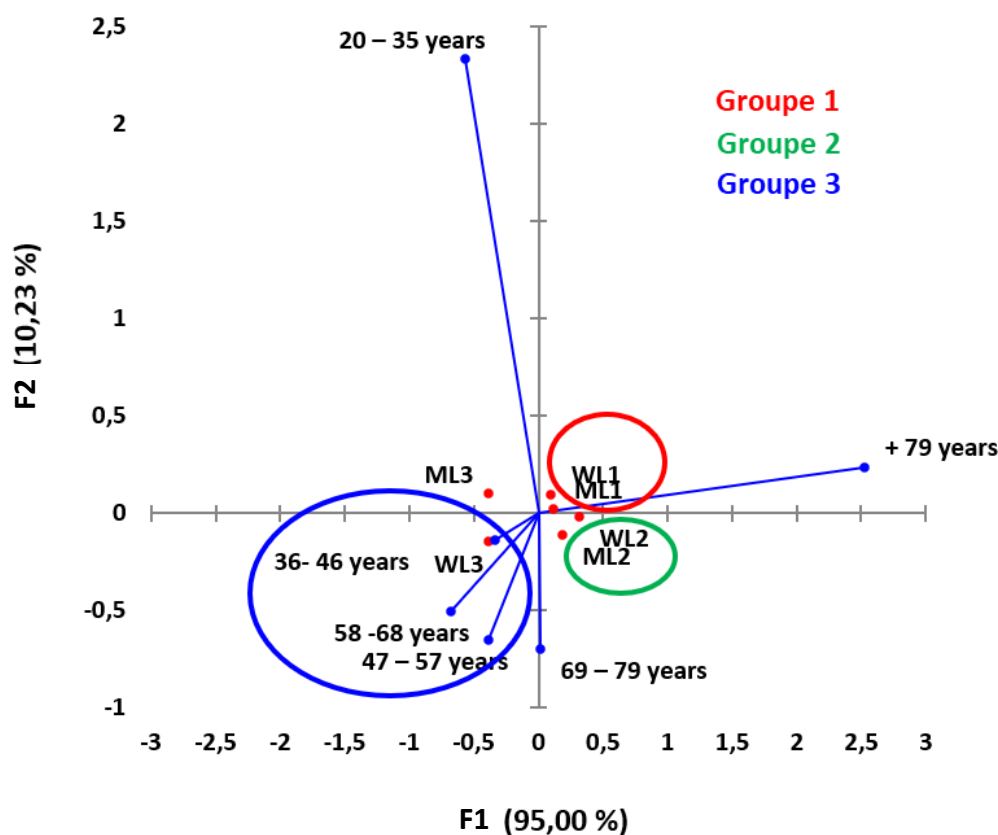


**Figure 3.** Factor analysis of the survey: Asymmetric column graph. (M: Men. W: Women. L: Level 1 = none, 2 = middle, 3 = secondary).

49.19%) (Figure 5).

**By level of education:** Illiterate people represent 37.54% of users of medicinal plants, followed by people with a secondary level of education (34.95%) and those with a medium level of education (27.5%) (Figure 6).

### 3.3. Use of medicinal plants in the study area

During our survey, we counted 62 medicinal species belonging to 32 botanical families, of which 18 were inventoried in the 4 stations studied, 27 were outside the surveys (species spontaneous to the region) and 17 were imported (Table 3).

**Analysis of survey forms:** The species used to traditionally cure diseases are either spontaneous in the region, naturalized or imported. Diseases treated include: digestive system, circulatory sys-

tem, urogenital system, respiratory system, headaches, hemorrhoids, cysts and stones, skin, mouth ulcers, hair loss and ENT diseases.

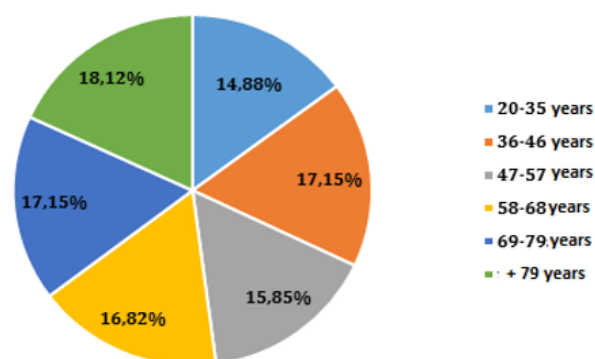


**Figure 4.** Distribution of the frequency of use of medicinal plants by age group.

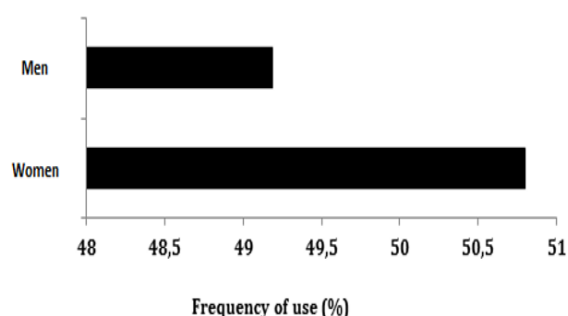


**Figure 5.** Distribution of the frequency of medicinal plant use by sex.

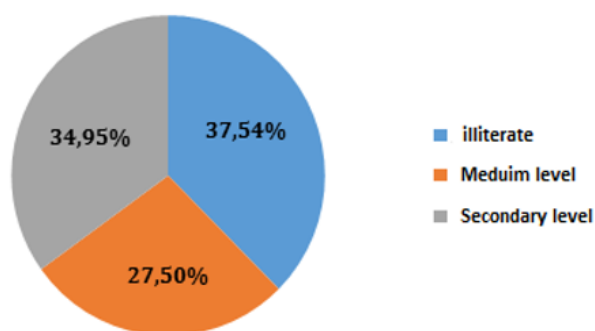


**Figure 6** Distribution of the frequency of use of medicinal plants according to the level of education.

**Relationship between botanical families and diseases:** 78 diseases are treated by 32 botanical families, with an average of 2.44 diseases per family. The Lamiaceae family, with 8 species, treats 37 diseases with 6 different recipes. Oleaceae treat 14 diseases, followed by Apiaceae, Asteraceae, Fabaceae and Poaceae (Figure 7).

**Relationship between diseases and recipes:** 18 recipes cover 78 diseases, representing an average of 0.23 recipes per disease. The number of recipes varies depending on the species and parts used (Figure 8).

**Recipe uses:** The majority of recipes are for internal use (78.15%), while external use is less widespread (21.85%) (Figure 9).

**Parts used:** The parts used, in descending order, are leaves (62.90%), roots (12.90%), seeds (9.68%), flowers, fruits and aerial part (4.83% each) (Figure 10). The predominance of use of one organ over another in the therapeutic field derives

from the concentration of active ingredients in this organ. The leaves are the most used because they are at the same time central to photochemical reactions and reservoirs of organic matter that derives from them. They provide the majority of alkaloids, heterosides and essential oils. Roots and seeds are rich in sugars and vitamins.

It was noticed that in the field, users tend to tear off the entire plant instead of focusing only on the desired part (mainly the leaves). Knowing that there is a clear relationship between the used part of the exploited plant and the effects of this exploitation on its existence. This harvesting method seriously compromises the sustainability of medicinal species, especially bulbous ones.

**Areas of therapeutic indication:** Medicinal species are primarily used against diseases of the digestive system (34.5%), followed by diseases of the circulatory system (23.24%), urogenital system (13.38%), skin (12.67%) and respiratory system (11.97%). Cysts and lithiasis are less represented (2.81% and 1.40% respectively).

**Table 3.** Medicinal plants excluding surveys.

| Botanical Family | Species                                              |
|------------------|------------------------------------------------------|
| Anacardiaceae    | <i>Pistacia atlantica</i> L.                         |
| Apiaceae         | <i>Anethum graveolens</i> L.                         |
| Apocynaceae      | <i>Nerium oleander</i> L.                            |
| Asteraceae       | <i>Inula viscosa</i> L. Ait                          |
|                  | <i>Echinops spinosa</i> L.                           |
|                  | <i>Atractylis cancellata</i> L.                      |
| Cupressaceae     | <i>Cupressus sempervirens</i> L.                     |
|                  | <i>Juniperus oxycedrus</i> L.                        |
| Lamiaceae        | <i>Ajuga iva</i> L. Schreb                           |
|                  | <i>Phlomis crinita</i> Cav.                          |
|                  | <i>Rosmarinus officinalis</i> L.                     |
|                  | <i>Mentha pulegium</i> L.                            |
| Moraceae         | <i>Morus alba</i> L.                                 |
| Myrtaceae        | <i>Eucalyptus globulus</i> Labil.                    |
| Malvaceae        | <i>Malva sylvestris</i> L.                           |
| Oleaceae         | <i>Phillyrea angustifolia</i> L.                     |
|                  | <i>Olea europea</i> L.                               |
|                  | <i>Fraxinus angustifolia</i> Vahl.                   |
| Papaveraceae     | <i>Papaver rhoeas</i> L.                             |
| Plantaginaceae   | <i>Plantago major</i> L.                             |
| Poaceae          | <i>Zea mays</i> L.                                   |
| Pinaceae         | <i>Pinus halepensis</i> Mill.                        |
| Rosaceae         | <i>Pyrus communis</i> ssp <i>gharbiana</i> (Trab.)M. |
| Rutaceae         | <i>Ruta chalepensis</i> L.                           |
| Rhamnaceae       | <i>Zizyphus lotus</i> (L.)Desf.                      |
| Tamaricaceae     | <i>Tamarix africana</i> Poiret.                      |
| Urticaceae       | <i>Urtica dioica</i> L.                              |

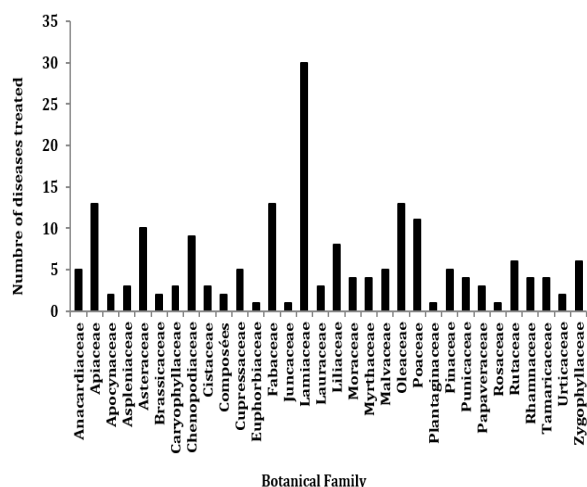


**Figure 7.** Variation in the number of diseases according to botanical families.

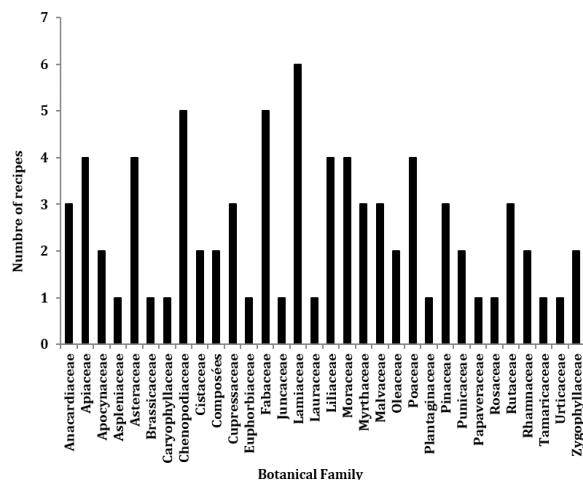


**Figure 8.** Variation in the number of recipes according to botanical families

**Synthesis of the results:** The Algerian steppe has a varied flora (FAO, 2012), with a spatial distribution and a recovery rate of species depending on the facies studied. Facies with White Wormwood, Alfa and Sparta are richer in medicinal species, while some rare species, such as *Scorzonera undulata*, have a low coverage. *Herniaria hirsuta* and *Peganum harmala* have a recovery rate of about 10%. In the stations at *Artemisia herba alba*, *Stipa tenacissima* and *Lygeum spartum*, no halophytic plants were encountered.

The ethnobotanical study carried out in the study site, allowed to highlight the important place

of traditional phytotherapy in the life of the residents of the region. The information acquired from the survey forms helped us to draw up a catalogue of 18 species inventoried in the 4 stations studied, 27 species are outside the records (spontaneous species in the region) and 17 species are imported. The results of ethnobotanical surveys show that middle-aged people (35-55 years) and women are those who use traditional herbal medicine the most.

Most of the medicinal species in the studied region are widely used in the treatment of digestive and metabolic disorders, genital infections, and

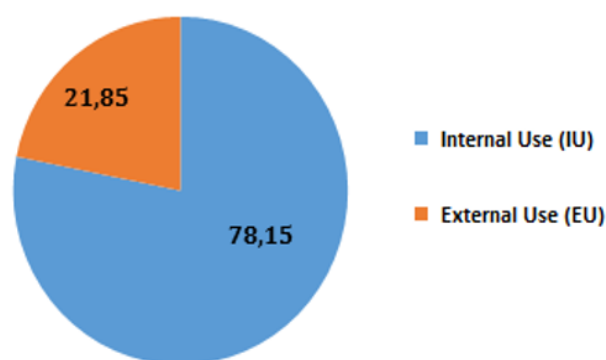


**Figure 9.** Percentage of recipe according to usage.

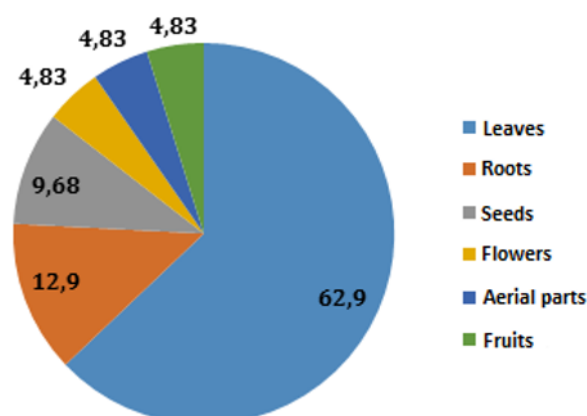


**Figure 10.** The different parts of the medicinal plants used.

skin conditions. The diseases identified are mainly treated by the leaves which constitutes the most used plant organ and by decoction which represents the most dominant method of preparation in traditional medicine in the region.

Cultivating medicinal plants and regulating the harvesting of wild plants could reduce the pressure on the medicinal plant species most used in traditional pharmacopoeia. When it comes to rare plants, plants threatened with extinction or plants overexploited for commercial purposes, cultivation is the only way to obtain the necessary plant quantities without further compromising the survival of these species (WHO, 1993).

The present work does not allow us to conclude that the local population is the main factor in the degradation of plant resources, since it is legitimate for them to collect medicinal plants to meet their needs; but it is surly that the method of collection and the heavy use of many species can contribute to the degradation of plant biodiversity. However, new practices of commodifying natural plant resources risk causing great harm to this biodiversity, hence the importance of an intelligent policy for the conservation of natural environments and sustainable development.

#### 4. Conclusion

Despite the development of the chemical medicine industry, traditional herbal medicine is currently remains an important source of remedy, especially for rural populations without access to modern medical care.

The study carried out in Ain Skhoune made it possible to inventory the medicinal plants used by the population and to draw up a catalogue of the most commonly used species.

Most of the inhabitants use these plants for treatment, because they prefer phytotherapy to conventional products, which can constitute a real threat to the existence of some plant species, or even lead to the destruction of their habitats.

This study allowed us to identify the most used medicinal plants in the study region. Among the most used species are: *Atriplex halimus*, *Artemisia herba alba*, *Peganum harmala*, *Marrubium vulgare*, which is in high demand in the region and is endangered due to its overexploitation.

Certainly plants have a healing effect, however the method of species removal (uprooting of plants) undoubtedly leads to a regression of these taxa, or even their elimination from our ecosystems.

In order to better know, preserve, value and study these spontaneous phylogenetic resources with maximum efficiency in the therapeutic field, it is necessary to regulate the exploitation of medicinal species, by raising awareness among people about the practice of uprooting and the evaluation of real exploitation possibilities.

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