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Floristic and Ethnobotanical Study of Medicinal Plants Used in the Treatment of Respiratory Diseases in Seksaoua Region (Western High Moroccan Atlas)

**Hind Sbai-Jouillil^{1*}, Anas Fadli², Mohamed El Hafian², Rachida El Ayad¹,
Omama Benharbit³ and Lahcen Zidane¹**

¹Laboratory of Natural Resources and Biodiversity, Department of Biology, Faculty of Science, Ibn Tofail University, B.P. 133 14000, Kenitra, Morocco.

²Laboratory of Botany, Biotechnology and Plant Protection, Department of Biology, Faculty of Science, Ibn Tofail University, B.P. 133 14000, Kenitra, Morocco.

³Laboratory of Biochemistry, Biotechnology, Health and Environment, Department of Biology, Faculty of Science, Ibn Tofail University, B.P. 133 14000, Kenitra, Morocco.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

This paper presents the results of a floristic and ethnobotanical study carried out in Seksaoua region (western High Atlas, Morocco), which aims to collect and document information about the diversity of medicinal flora used in traditional herbal medicines in this region.

The study, which covered 30 stations, was conducted during the season 2014-2015 using 746 investigation sheets and stratified method for sampling. The results obtained reported a total of 98

*Corresponding author: E-mail: Hind.sb.hs@gmail.com;

plant species used against respiratory diseases by the local population of Seksaoua. These species were identified as belonging to 81 genera and 43 families with the domination of Lamiaceae (19), Asteraceae (8) and Apiaceae (7). Leaves (22.33%) and seeds (20.58%) were the most used plant parts and decoction was the most used method for medicine preparation.

This study presents a useful data and starting point for future research on chemical compounds of medicinal plants. It also provides a scientific basis to sensitize people to the importance of local medicinal plant heritage and to adjust their traditional use of these plants in such a way to avoid toxicities.

Keywords: *Seksaoua; medicinal plants; ethnobotany; respiratory system; survey.*

1. INTRODUCTION

Respiratory disease is a medical term that encompasses pathological conditions affecting the airways, including nasal passages, bronchi and lungs. They range from mild and self-limiting, such as the common cold, to acute infections such as bacterial pneumonia, bronchitis and chronic conditions like asthma or chronic obstructive pulmonary disease. Respiratory disease causes a huge worldwide health burden. It is estimated that 55 million people suffer from Respiratory diseases [1]. At national level and according to ENPSF (National Survey on Population and Family Health), 44.7% of children under the age of five were suffering from fever and cough in 2011. In the same year, the percentage of children who suffered from cough associated with breathing difficulties was estimated to 13.4% [2].

Respiratory disease places a huge economic burden not only for the families of patients, but for communities in general: the burden includes human lives and financial costs related to temporary incapacity, school absenteeism, loss of working days, travel to healthcare facilities, medicines and hospitalization [3].

To treat respiratory disease, people from many regions around the world (Africa, Asia and Latin America) use traditional medicine which enables them to meet some of their needs in terms of primary health care. In Africa, for example, up to 80% of the populations use traditional medicine for this purpose [4]. Arabs in general and Moroccans in particular have been using plants as a source of drugs, power and beautification since ancient times [5]. According to Sejlmassi [6], a large majority of essential medicines, which exist nowadays in drugstores, are cultural and therapeutic legacies handed down from the past.

In this context, we report herein the results of an ethnobotanical and floristic study that was

conducted in Seksaoua region (western High Atlas, Morocco) by using a field survey, which allowed to establish an inventory of plant species and traditional methods used for the treatment of respiratory disorders in this region.

2. MATERIALS AND METHODS

2.1 Description of the Study Area

Chichaoua province, which covers an area of 6872 km², is bounded to the north by Safi province, to the south by Taroudant and Agadir, to the east by Haouz and Menara provinces and to the west by Essaouira. According to precipitation, relief and soil type, Chichaoua province is subdivided into three homogeneous territorial units: mountain, piedmont and plain areas. The mountain area includes the region studied in this paper (Western High Atlas, Seksaoua) (Latitude: 31 / Longitude: -8.73) (Fig. 1) [7]. The population of this region was estimated in 2014 to 63 761 inhabitants and the local language is Amazigh [8].

Economic activity in Seksaoua region is mainly agro-pastoral relying on cereal farming and extensive livestock farming. Concerning crop production, cereals (23%) and fruit trees (18%) are predominant in the production system of this area. However, the yields remain low for all crops (79.5 quintals / ha) and animal productions (2029 T). It is also important to note that this region is home to 57% of Chichaoua goats, because of the adaptation of this species to mountain conditions and the secular breeding tradition in the area. The region is characterized by a continental and semi-desert climate marked by rainfall insufficiency and irregularity. The average annual rainfall is 350 to 400 mm. The perennial springs present in the region supply small perimeters totaling 450 sources with a flow rate ranging from 5 l / s to 20 l / s. Regarding topography, Seksaoua is characterized by a

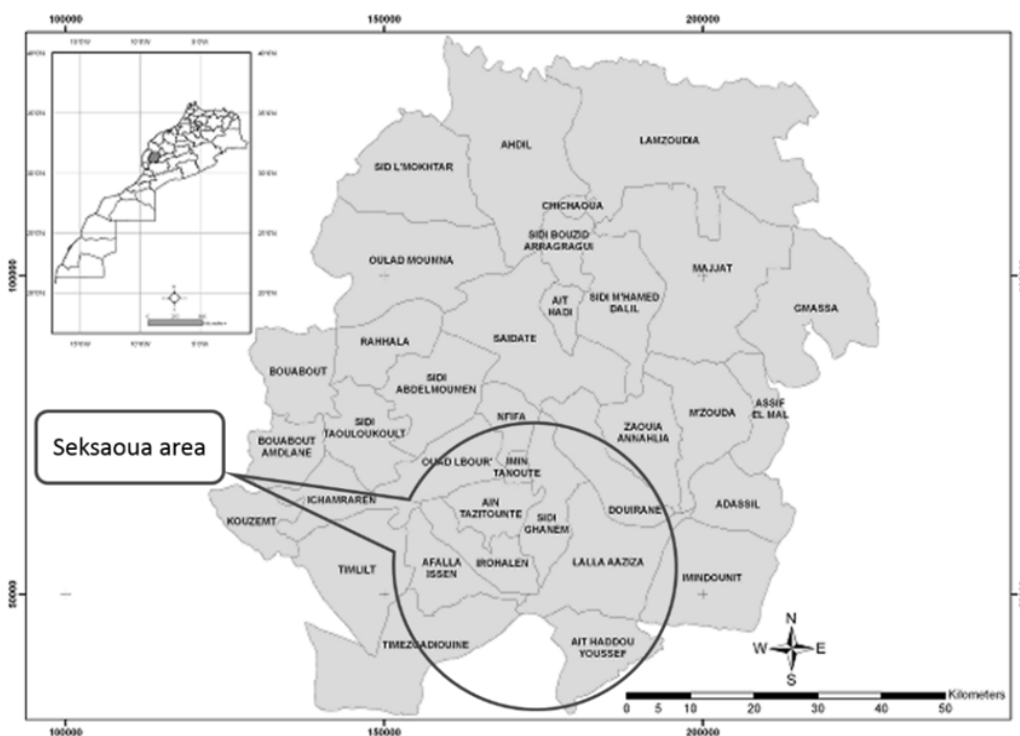


Fig. 1. Location of Seksaoua area (Western High Atlas Morocco)

rugged relief and skeletal soils. The economy of the population is mainly based on agriculture, livestock and crafts [7].

2.2 Methodology

Our field study was carried from April 2015 to May 2016 through the conduction of ethnobotanical interviews with the local population of Seksaoua region. The survey covered 4 rural communities: Ait Hadoou Youssef, Irohale, Lalla Aziza and Sidi Ghanem. The region was divided, into 29 doors (villages), according to variations in environmental factors such as climate, soil and vegetation.

The stratified sampling method [9] allowed us to identify the different survey environments. This technique is intended to help obtain a more complete floristic inventory and conduct ethnobotanical surveys that differ from one station of the study area to another [10].

At each interview, we collected all relevant information about the respondent (sex, age, therapeutic practice ... etc.) and the medicinal plants used (vernacular name, part used, mode of preparation, type of disease treated ...etc.).

The ethnobotanical data collected from field surveys was then organized into a database, processed, analyzed and interpreted using Microsoft Excel software (version 2013).

Taxonomic identification of plant samples collected from the different stations was subsequently carried out at Laboratory of Science and Biodiversity in Kenitra, using some botanical references such as: [11,6,12,13,14,5, 15,16,17].

3. RESULTS AND DISCUSSION

3.1 Use of Traditional Medicine vs. Modern Medicine in Seksaoua Region

The analysis of ethnobotanical data showed that 88% of respondents use only traditional medicine in case of illness, whereas a proportion of 12% use modern medicine.

The frequent use of medicinal plants by local populations of Morocco for primary health care is widely reported in literature. Depending on authors and study areas, the rate of herbal medicine use varies from 70.7% to 92% [18,19,20,21,22].

3.2 Relationship between Gender and Use of Medicinal Plants

The results (Table 1) have shown that men use modern medicine at a higher rate (40%) than traditional medicine (26.7%). By contrast, the rate of women who use modern medicine (60, 20%) was slightly lower than that of women who use traditional medicine (73, 30%). This may be explained by the facts that women comply more with traditional cultures [23,24] and that women living in these remote areas are usually housewives with no other occupation, which made them available to answer our questions during the investigation period [25].

3.3 Relationship between Occupational Status and Use of Medicinal Plants

Among active respondents, the rate of modern medicine use was higher than that of traditional medicine use (39% against 25%), while the opposite was observed in the inactive population (61% against 75%) (Table 1). Similar results were obtained in an earlier study in the Haouz Rhamna region [21].

These results show clearly that the use of medicinal plants depends on professional status. The frequent use of traditional medicine by the inactive population is certainly due to the high costs of modern medicine, which include the costs of travel to healthcare facilities. According to the General Directorate of Local Authorities, 70% of the stations covered by the study area are characterized by high poverty rates (25.01 to 34.93%), whereas only two stations present relatively low rates (14.01 and 18.38%) [26].

3.4 Relationship between Geographical Position and Use of Medicinal Plants

Fig. 2 shows the relation between the frequency of medicinal plant use at each station and the distance in kilometers (as the crow flies) between

the station and the nearest healthcare facility. Generally, we found that the more remote the station is from health facilities, the more frequent the use of medicinal plants. This tendency confirms our hypothesis, which considered the high travel costs as a plausible reason for resorting to traditional medicine.

3.5 Methods of Medicine Preparation

Table 2 lists the most used plants in the treatment of respiratory diseases as classified in alphabetical order according to their scientific name, vernacular name (in Arab or Amazigh), preparation method, frequency of use, traditional use in Seksaoua and therapeutic use as cited by other authors.

Decoction and cooking, which were reported for 72 and 26 species respectively, were the most known and used preparation methods by the population studied for the treatment of respiratory diseases. Other modes - of less importance - were also reported for 30 species such as powder, spray, infusion, poultices and raw (Fig. 3).

3.6 Plant Parts Used in the Treatments

Leaves, seeds and aerial parts were the most used in the treatment of respiratory disorders as reported for 26, 21 and 19 species respectively (Fig. 4). The frequent use of leaves is particularly encouraged by their easy harvest [27].

3.7 Floristic Analysis of Data

Floristic analysis of collected data has helped to develop a list of 98 medicinal species that are used in the treatment of respiratory disorders in Seksaoua region. These were classified into 81 genera and 43 botanical families (Table 2). 14% of them were remarkably identified as endemic species of Morocco.

Table 1. Percentage of use of traditional (MT) and modern medicine (MM) according to gender and professional status of Seksaoua population

	% of use according to gender		% of use according to professional status	
	Women	Men	Active	Inactive
MM	60,20	39,80	39,00	61,00
MT	73,30	26,70	25,00	75,00

**The total number of persons interviewed is 746, the number of respondents who use traditional medicine is 648 and the number of respondents who use modern medicine is 98*

Table 2. List of medicinal plants most used for treatment of respiratory disorders in Seksaoua region (Morocco)

Family	Scientific name	Vernacular name (Arabe or Amazigh)	Part(s) used	Preparation methods	Frequency of citation	Traditional therapeutic use in Seksaoua	Therapeutic use cited by other authors
Amaryllidaceae	<i>Allium sativum</i>	Tiskert	Bulb	Raw/Cooked	194	Cooling, influenza, cough and pharyngitis	Treatment of asthma [28] and respiratory diseases [29], [19], [30].
Asteraceae	<i>Artemisia herba alba</i>	Sih	Aerial part	Decoction	285	Cooling, influenza, cough and pharyngitis	Treatment of respiratory diseases [31].
Lamiaceae	<i>Lavandula atlantica</i>	izri	Flower	Decoction	111	Cooling, influenza, cough and pharyngitis	Treatment of asthma and cough [32].
	<i>Lavandula dentata</i>	Lokhzam	Flower	Decoction	173	Sinusitis	Treatment of cooling [20], [18] and cough [18].
	<i>Lavandula pedunculata</i>	Lokhzam	Flower	Decoction	173	Sinusitis	Treatment of cough [33].
	<i>Marrubium vulgare</i>	Ifzi	Leaves	Decoction	87	Cooling, influenza, cough and pharyngitis	Treatment of rhinitis [34] and respiratory diseases [18].
	<i>Mentha pulegium</i>	Fliyo	Aerial part	Decoction	85	Cooling, influenza, cough and pharyngitis	Treatment of respiratory diseases [20], [35].
	<i>Mentha suaveolens</i>	Timjja	Aerial part	Decoction	71	Cooling, influenza, cough and pharyngitis	it used for the treatment of cooling [17], [20].
	<i>Origanum compactum</i>	Azokéni	Leaves	Decoction	367	Cooling, influenza, cough and pharyngitis	Treatment of cooling [36], [20], bronchitis [36] and broncho-pulmonary diseases [17].
	<i>Thymus maroccanus</i>	Tazoknit	Leaves	Decoction	367	Cooling, influenza, cough and pharyngitis	Treatment of cooling [31] and respiratory diseases [19], [30].
	<i>Thymus broussonnetii</i>	Tazokénit	Leaves	Decoction	367	Cooling, influenza, cough and pharyngitis	Treatment of respiratory diseases [37].
	<i>Thymus satureioides</i>	Tazokénit	Leaves	Decoction	367	Cooling, influenza, cough and pharyngitis	Treatment of cough , bronchitis [17], respiratory diseases, cooling and influenza [18].
Oleaceae	<i>Olea europaea</i>	Zitone	Fruit	Raw	187	Cooling, influenza, cough and pharyngitis	Treatment of cough [28], [19], [30].

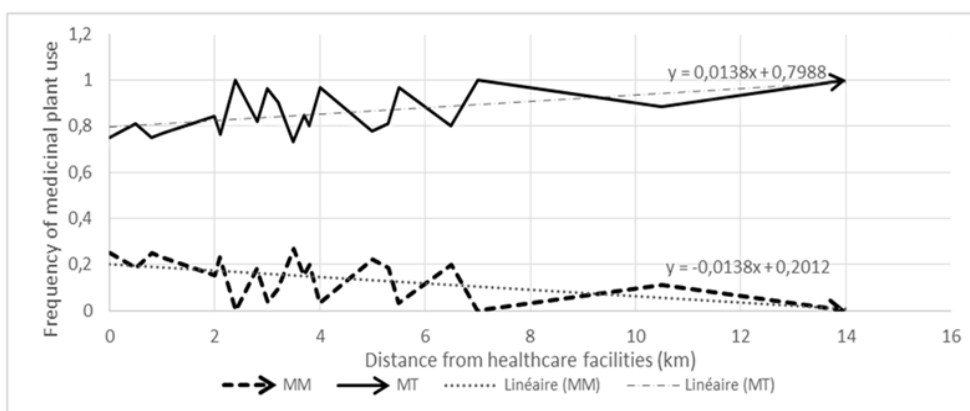


Fig. 2. Frequency of medicinal plant use in the study area (MM: Modern medicine; MT; Traditional medicine)

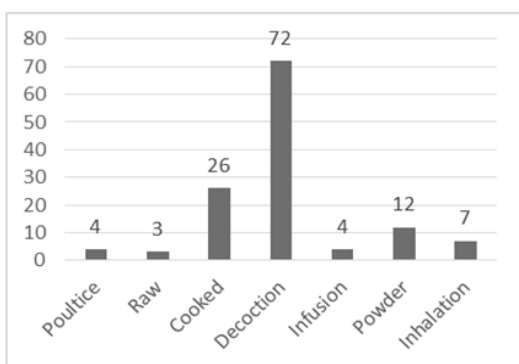


Fig. 3. Frequency of preparation methods used in traditional herbal medicine for the treatment of respiratory disease in Seksaoua region

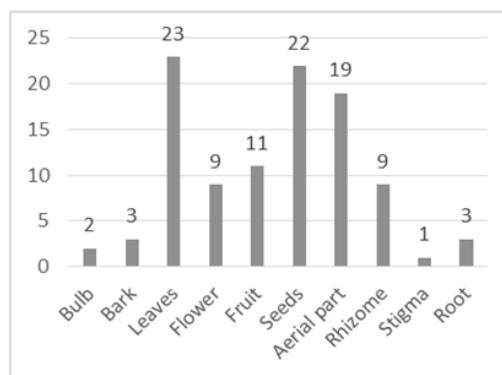


Fig. 4. Frequency of plant parts used for the treatment of respiratory diseases in Seksaoua region

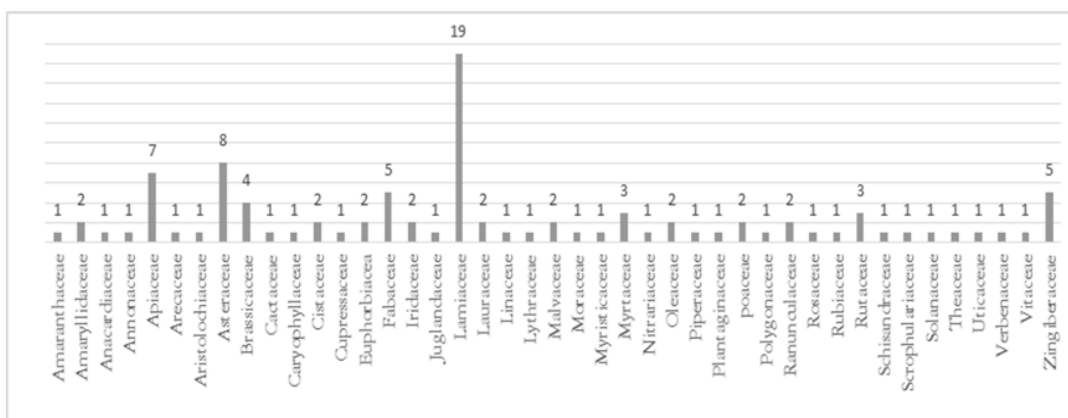


Fig. 5. Frequency of use of medicinal plants for the treatment of respiratory diseases in Seksaoua region, as classified by botanical families

Among botanical families (Table 2), Lamiaceae predominates in the region with 19 representative species (19.19%), followed by Asteraceae with 8 species (8.16%), Apiaceae

with 7 species (7.14%), Zingiberaceae and Fabaceae with 5 species each (5.05%), Brassicaceae with 4 species (4.04%) and Rutaceae and Myrtaceae families with 3 species each (3.03%). The remaining botanical families, which include 44 species are represented by only one or two species each.

4. CONCLUSION

The difficulties of living conditions, poverty, geographic isolation and the lack of medical services in rural mountainous areas are some factors that encourage the use of traditional medicine by the population of Seksaoua region to treat their respiratory ailments. This was confirmed by the results of our field survey, which shows that the use of traditional medicine in this region depends on professional status of the population and the remoteness from health care facilities.

The ethnobotanical and floristic analyses highlighted the diversity of medicinal flora, which is used in Seksaoua for the treatment of respiratory diseases. The great number of surveyed species is probably due to the harsh mountain climate of the region, which imposed on the population the development of a significant knowledge of plant resources enabling them to resist to cold winters. In total, the inventory we developed included 98 species that were classified into 43 families and 81 genera with a domination of Lamiaceae (19.19%) among families and *Origanum compactum*, *Thymus maroccanus*, *Artemisia herba alba* and *Allium* among species. Furthermore, our field investigation revealed that leaves and seeds are the most used plant parts and decoction is the most applied method by the local population of Seksaoua for preparation of medicine.

These results may pave the way for future research on chemical compounds of medicinal plants. They may also raise the awareness about the importance of local medicinal plant heritage and sensitize people to better adjust their traditional use of herbal medicine in such a way to avoid plant toxicity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Health Organization WHO. World Health Report 2003. 2007;129.
2. Ministry of Health in Morocco. Report of the National Population and Family Health Survey (NPHS). 2011;37.
3. Ministry of Health in Morocco. Health status of the Moroccan population. 2012;58.
4. Sofowora A. Medicinal plants and traditional medicine in Africa. KARTHALA Edition. 1th ed. Nigeria. 2010;110.
5. Hmamouchi M. Moroccan herbal and medicinal plants. 2th Ed. Rabat. 2001;389.
6. Sijelmassi A. Medicinal plants of Morocco, 6th ed. Fennec. Casablanca. 1993;285.
7. Regional Directorate of Agriculture in Chichaoua. Monograph of the province of Chichaoua. 2004;19.
8. High Commission for the Plan of Morocco. General population census; 2014.
9. Daget P, Godron M. Frequency analysis of species ecology in communities. Masson. 1982;163.
10. Lahsissene H, Kahouadji A, Tijane M, Hseini S. Catalog of medicinal plants used in the region of Zaër (western Morocco). Lejeunia; 2009. BE ISSN 0457-4184. French
11. Fennane M, Ibn Tattou M, Mathez J, Ouyahya A, El Oualidi J. Flore pratique du Maroc Vol. I. Work of the scientific institute. Rabat, Série Botanique 36. 1999;558.
12. Fennane M, Ibn Tattou J, Ouyahya A, El Oualidi J. Flore pratique du Maroc. Work of the scientific institute. Rabat. 2007;2:648.
13. Fennane M, Ibn Tattou J, EL Oualidi J. Flore pratique du Maroc. Work of the scientific institute. Rabat. 2014;3:793.
14. Bellakhdar J. The traditional Moroccan pharmacopoeia. Ancient Arab Medicine and Popular Knowledge. Ed. Fennec, Casablanca; Ibis Press. 1997a;764.
15. Lavergne R, Véra R. Ethnobotanical study of medicinal plants used in the traditional pharmacopoeia in Réunion. Agency for Cultural and Technical Cooperation. Traditional Medicine and Pharmacopoeia. 1989;236.
16. Iserin P, Masson M, Restellini JP, Ybert E, Moulard F. Larousse encyclopedia of medicinal plants. 2th ed. ISBN 2-03-560252-1. 2001;335.
17. Bellakhdar J. Contribution to the study of traditional pharmacopoeia in Morocco: Current situation, knowledge products and resources. Phd Thesis. Fac. Biology. Univ. Metz in France. 1997b;628.
18. El Hafian M, Benhamdini N, El Yacoubi H, Zidane L, Rochdi A. Floristic and

- ethnobotanical study of medicinal plants used in the prefecture of Agadir-Ida-Outanane (Morocco). *Journal of Applied Biosciences*. 2014;81:7198-7213.
19. El Hilah F, Ben Akka F, Dahmani J, Belahbib N, Zidane L. Ethnobotanical study of medicinal plants used in the treatment of respiratory tract infections in the central Moroccan plateau. *Journal of Animal and Plant Science*. 2015;25(2): 3886-3897. French
 20. Benlamdini N, Elhafian M, Rochdi A, Zidane L. A floristic and ethnobotanical study of the medicinal flora of the High Eastern Atlas (Haute Moulouya). *Journal of Applied Bioscience*. 2014;78:6771-6787. French
 21. Benkhniq O, Ben Akka F, Salhi S, Fadli M, Douira A, Zidan, L. Catalog of medicinal plants used in the treatment of diabetes in the region of Al Haouz-Rhamna (Morocco). *Journal of Animal and Plant Sciences*. 2014;23(1):3539-3568. French
 22. El Rhaffari L, Zaidi A. Practice of phytotherapy in the south-east of Morocco (Tafilalet): an empirical knowledge for a practice for a renovated pharmacopoeia. From the sources of knowledge to the medicines of the future. In: 4th European Congress on Ethnopharmacology, Univ Metz in Paris. 2002;293-318. French
 23. El Yahyaoui O, Ait Ouaziz N, Sammama A, Kerroui S, Bouabid B, Lrhorfi LA, Zidane L, Bengueddour R. Ethnobotanical study: Medicinal plants marketed in the province of Laâyoune; identification and use. *International Journal of Innovation and Applied Studies*. 2015;12(3):533-541.
 24. Nabih M. Ethnobotanical study: Medicinal plants marketed in the province of Laâyoune; identification and use. Phd Thesis in Pharmacy. Faculty of Medicine and Pharmacy. Rabat. Morocco. 1992;195.
 25. Jouad H, Haloui M, Rhiouani H, El Hilaly J, Eddouks M. Ethnobotanical survey of medicinal plants used for the treatment of diabètes, cardiac and renal diseases in the North centre region of Morocco (Fes-Boulmane). *Journal of Ethnopharmacology*. 2001;77:175-182.
 26. Directorate General of Local Government (DGCL) / Ministry of the Interior Morocco. The region of Marrakech - Safi: General monograph. 2015;64.
 27. Bistindou M. Inquiry on traditional herbal medicine in Kindamba and Odzala (Congo) and analysis of convergences of use of medicinal plants in Central Africa. Phd Thesis. Univ. Free in Brussels. 1986;482.
 28. Alzweiri M, Sarhan AA, Mansi K, Hudaib M, Aburjai T. Ethnopharmacological survey of medicinal herbs in Jordan, the Northern Badia region. *Journal of Ethnopharmacology*. 2011;137(1):27-35.
 29. Carrió E, Vallès J. Ethnobotany of medicinal plants used in Eastern Mallorca (Balearic Islands, Mediterranean Sea). *Journal of Ethnopharmacology*. 2012; 141(3):1021-104.
 30. EL Hilah F. Floristic and ethnobotanical study of medicinal plants among the population of the central Moroccan plateau. Phd Thesis. Univ. Ibn Tofail. Kenitra. Morocco. 2016;151.
 31. Teixidor-Toneu I, Martin GJ, Ouhammou A, Puri RK, Hawkins JA. An ethnomedicinal survey of a Tashelhit-speaking community in the High Atlas, Morocco. *Journal of Ethnopharmacology*. 2016;188:96–110.
 32. Ennabili A, Gharnit N, Maach Y, El Meskaoui A, Bousta D. Exploitation of medicinal and food plants in the watershed of the Oued Laou (northwestern Morocco). *J Bot Soc Bot France*. 2006;36:71-79. French
 33. Ferreira A, Proença C, Serralheiro MLM, Araújo MEM. The *in vitro* screening for acetylcholinesterase inhibition and antioxidant activity of medicinal plants from Portugal. *Journal of Ethnopharmacology*. 2006;108(1):31-37.
 34. El Azzouzi F, Zidane L. The traditional medicinal flora of the Beni-Mellal region (Morocco). *Journal of Applied Biosciences*. 2015;91(1):8493-8502. French
 35. Eddouks M, Ajebli M, Hebi M. Ethnopharmacological survey of medicinal plants used in Daraa-Tafilalet region (Province of Errachidia), Morocco. *Journal of Ethnopharmacology*. 2017;198:516-530.
 36. Bammi J, Douira A. Medicinal plants in the Achahch forest (Central Plateau Morocco). *Acta Botanica Malacitana*. 2002;27:131-145. French
 37. Mehdioui R, Kahouadji A. Etude ethnobotanique auprès de la population riveraine de la forêt d'Amsittène: Cas de la Commune d'Imi n'Tlit (Province d'Essaouira). *Bulletin of the Scientific Institute, Rabat, Life Sciences Section*. 2007;29:11-20. French

APPENDIX

Survey Medicinal and Herbal Plants

Date:
Region:
Commune:
Author:
Place:

Informant:

Age:
Profession:
Family situation: Single Married
Gender: Male Female
Education Level: primary secondary university
Locality : Douar village city nomad

Therapeutic practices:

When you feel sick, you address:
A traditional medicine , why: effective cheapest
Acquisition drug ineffective
A modern medicine , why : effective accuracy
If both, what is the first one:
Modern medicine Traditional medicine

Plant material:

Vernacular name:
Scientific name:
Part used : Stem Flowers Fruits Seed Bark Rhizome Bulb Sheets
Whole plant Other combinations
Form of use : herb tea Powder Essential Oils
Extract (tincture, solution, capsule)
Mode of preparation:
Infusion Decoction Cataplasm raw Cooked Others
Mode of administration:
Oral Massage Rinsing Slathering Others
Posology:
Number of catch per day: For the children: Once/day Twice/day 3 times/day
Others
For the elderly people: Once/day Twice/day 3 times/day Others
For the Adults: Once/day Twice/day 3 times/day Others
Duration of use (treatment duration): One Day One week One month Until healing

Use:

Type of disease:

- Dermatological infections
- Respiratory affections
- Cardiovascular affections
- Genito-urinary affections
- Osteo-articular affections
- Metabolic affections
- Digestive affections
- Digestive additional glands affections
- Neurological affections

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