



E-ISSN: 2321-2187
P-ISSN: 2394-0514
IJHM 2017; 5(2): 18-22
Received: 16-01-2017
Accepted: 18-02-2017

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Identification and ethnobotanical study of commercialized medicinal plants in Central Middle Atlas of Morocco

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Abstract

Ethnobotanical study of commercialized medicinal plants in Central Middle Atlas of Morocco was conducted between February and August 2016. The indigenous knowledge of traditional use for medicinal purposes was collected through questionnaire and personal interviews especially with the Amazigh (Berber) communities. In this study, interviews were conducted with 120 medicinal herb vendors in 13 localities in Middle Atlas Mountains. The results show that 69 medicinal species were inventoried in the study area. These plant species are included into 36 families. The most represented families are: Lamiaceae (12 species) and Asteraceae (10 species). The most frequently mentioned indications were digestive system disorders, metabolic diseases and Skin diseases. The majority of remedies are administered orally and decoctions were the most frequently prepared formulation. Aerial part is the most frequently used part in preparing herbal remedies. The aim of this study is to document medicinal plants used by the Berber population of the Middle Atlas and to valorize the use and associated traditional knowledge.

Keywords: Ethnobotany, Medicinal plants, Middle Atlas, Traditional pharmacopoeia

1. Introduction

The geographical location of Morocco confers to it a great bioclimatic variety and a particular floristic diversity. The flora of the country has more than 7000 species and subspecies among which approximately 800 are aromatic and medicinal plants ^[1].

Medicinal plants occupy an important place in traditional medicine and play an important role in the Moroccan economy. Indeed, the medicinal and aromatic plant (MAP) sector plays a very important socio-economic role, with annual revenues generated from MAP export of about US\$ 55.9 million ^[2].

The Moroccan MAP sector provides employment to local and rural communities generating an estimated 500,000 work days per year. The main export markets for Moroccan MAPs are the France and the United States of America but export quantities are increasing due to opening of other markets including, namely Japan, Canada, Switzerland, Spain, and Germany ^[2].

Morocco is known for the richness of its phyto therapeutic heritage. But research on traditional pharmacopoeia in different areas of the country is scarce and insufficient. However, interesting studies have been carried out in recent years in different regions of Morocco ^[3, 4, 5, 6, 7].

The medicinal plant sector in Morocco has many weaknesses and anarchies and this floristic potential remains under exploited and threatened. The scientific community is called upon to act by recommendations and concrete actions for good management and to protect biodiversity.

The aim of this study is to create a catalog of medicinal plants, in order to preserve the indigenous knowledge of the Berbers of the Middle Atlas which are mainly based on oral traditions. And also to contribute to the preservation of this thousand-year-old Indigenous phytotherapy heritage and to promote the sustainable exploitation of these plant resources.

2. Materials and methods

2.1 Study area

The middle atlas is one of the four Moroccan mountain ranges situated between the Rif range to the north and the High-Atlas range to the south. It is one of the world's richest places in terms of plant diversity. Indeed, the geographical location of the Central Middle Atlas allows a great bioclimatic diversity which promotes the development of herbaceous plants and a protective forest cover. Because of its elevation, the mountains experiences snow during the winter months and a cool climate during the summer.

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The Study area occupies an important area in Mountain chains of the middle atlas (Figure 1) and containing two national parks (Ifrane National Park and Khenifra National Park) considered as Plant Biodiversity Hotspots [8, 9]. It includes villages and rural areas of the cities of Khenifra, Ifrane, Azrou, Mrirt and Lekbab. Major activity of the rural people depends on agriculture and

pastoralism and they have limited access to medical service. Plant-derived products are used in the production of traditional medicines, cosmetics and perfumes. They are particularly important for people of the region, as they are sometimes the only source of medicine readily available [9]. The conditions of hospitalization of patients and medical care are difficult.

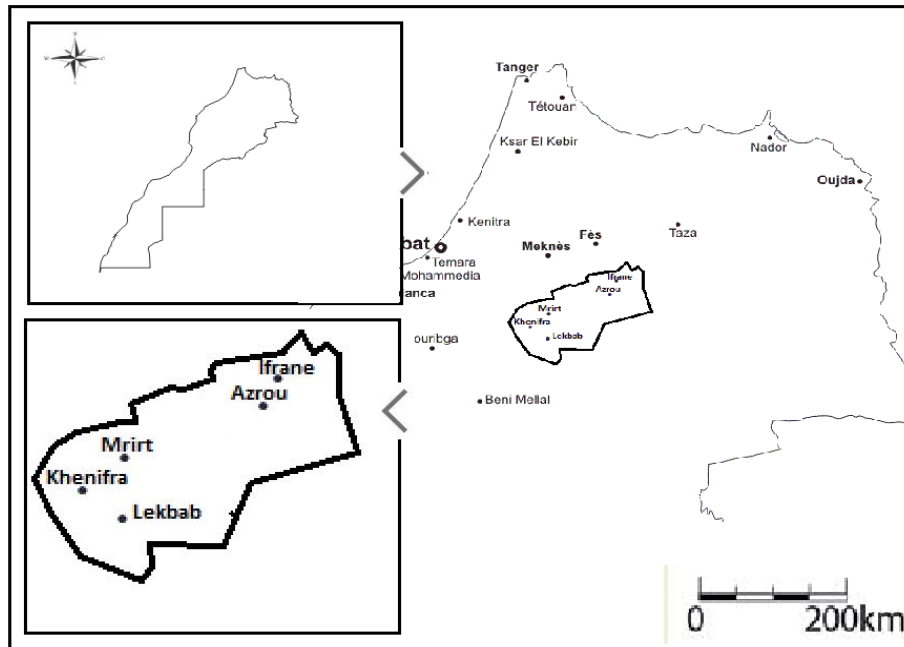


Fig 1: Location map of study area.

2.2 Data Collection

During the survey, frequent field trips and plant collections from plant vendors were made from various far flung and remote regions of the study area from February 2016 to August 2016. The collection covered both dry plants and fresh plants (Figure 2). The information are collected by using a pre-quiz sheet included research area (district,

village), local name of the traditional medicinal plant, diseases treated, parts used, method of preparation, methods of administration and ingredients added. The location of the different sampling sites was determined by the stratified sampling method.

One hundred twenty informants (34 males and 86 females) aged 32 to 86 were interviewed in this research.



Fig 2: Dried (A) and fresh (B) medicinal plants exposed for sale in the Middle Atlas Souks

2.3 Species identification

The taxonomic identification was carried out by the botanical team of Environment and Soil Microbiology Unit of Moulay Ismail University's Faculty of Science and using the Flora, the catalogue and various books of botany and medicinal plants.

3. Results and Discussion

3.1 Floristic Aspect

Botanical study allowed us to identify sixty-nine plant species belonging to 36 families. The most represented

families are Lamiaceae (13 species), Asteraceae (10 species), and Apiaceae, Euphorbiaceae, and Fabaceae (3 species each) (Table 1). Lamiaceae and Asteraceae families, which are well represented in the Middle Atlas area, are also among the nine main families in the spontaneous flora of Morocco [6, 7, 10]. And constitute the most used groups in phytotherapy in most of other Mediterranean countries [11, 12, 13]. However, the botanical families least represented with a single species are the main source of the medicinal flora with a percentage of 36% (Table 1).

Table 1: Plant families, number of medicinal plant species and proportions

No	Family	No of species in each	% of each	% of total
1	Lamiaceae	13	18,84	18,84
2	Asteraceae	10	14,49	14,49
3	Apiaceae, Euphorbiaceae, Fabaceae (Three families)	3	4,34	13,02
4	Apocynaceae, Caryophyllaceae, Myrtaceae, Rhamnaceae, Rosaceae, Verbenaceae (Six families)	2	3,07	18,42
5	Anacardiaceae, Aristolochiaceae, Berberidaceae, Brassicaceae, <i>Cactaceae</i> , Chenopodiaceae, Cistaceae, Cucurbitaceae, Cupressaceae, Ericaceae, Fagaceae, Juglandaceae, Gentianaceae, Lauraceae, Lythraceae, Moraceae, Oleaceae, Palmae, Poaceae, Portulacaceae, Rubiaceae, Rutaceae, Thyelaeaceae, Urticaceae, <i>Xanthorrhoeaceae</i> (Twenty five families)	1	1,44	36
Total	Total of Families: 36	Total of species: 69		

3.2 Medicinal plants and therapeutic treatments

The most frequently mentioned indications were digestive system disorders (26, 56%), metabolic diseases (12, 06%), skin diseases (11, 84%), fever (7, 34%) and respiratory problems (7, 03%) (Figure 3). The remains of the species serves to treat heart and high blood pressure (HBP or hypertension) (6, 25%), Treatment of renal disease (6, 25), dental and oral healthcare (3, 9%), genitourinary diseases (3, 9%), dysmenorrheal (3, 12%) and others (Asthma, allergy treatment, intoxication, edema, auditory apparatus and the nervous, etc.) (6, 25%). The proportion of remedies used for treatment of digestive system disorders related disease are also high in most studies conducted in Morocco [6, 7, 14].

During the survey, some sellers of medicinal plants interviewed indicated that a spiritual component is also involved in the use of plants for the treatment of specific ailment. This represents a common element of traditional health practices [15].

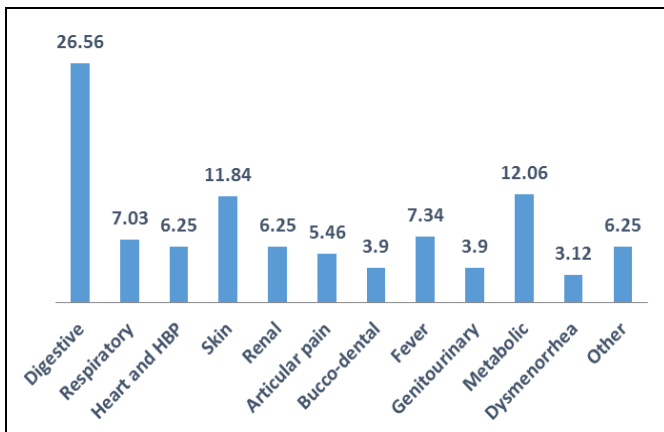


Fig 3: Percentage of uses of medicinal plants in the treatment of diseases

3.3 Plant part used

According to the investigation, local populations of the Middle Atlas region usually utilize every part of the plant. However, the use of a particular plant part depends on the availability of the fresh medicinal plants and user's needs.

Aerial part contribute about 27, 61% of plant part used and followed by leaves (19, 04%) flower (11, 42%), root (9, 52%), fruit (7,61%), whole plant (5, 71%), leafy stem (5, 71), seeds (4, 76%), bark (3, 8%) and others (essential oils, oil, extract, resin, bulb, etc.) (4, 76%) (Figure 4). There are some cases where different parts of the same plant being used to treat different ailment. There are also instances where a mixture of several plants is used to treat a particular ailment. For example, the administration of several plants is

done by mixing them with olive oil and adding garlic, oregano, ginger or other herbs and condiments.

Our findings of the frequent use of aerial part and leaves in the preparation of remedies corroborate results of several studies conducted in Morocco or in Mediterranean countries [6, 16, 17, 18, 19] and other countries [19, 20, 21].

The first reason for wide use of leaves for therapeutic purposes is that leaf harvesting is relatively a sustainable practice compared to utilization of other plant parts [22]. The second reason for wide use of leaves could be due to the fact that leaves are the seat of photosynthesis and sometimes also the storage of secondary metabolites which may be account for their medicinal properties [23]. The use of plant roots can jeopardize survival of the plant or even its disappearance [24]. The use of particular plant parts suggests that these parts have very efficient medicinal properties but it needs biochemical studies and pharmaceutical screening to cross-check the local practice,

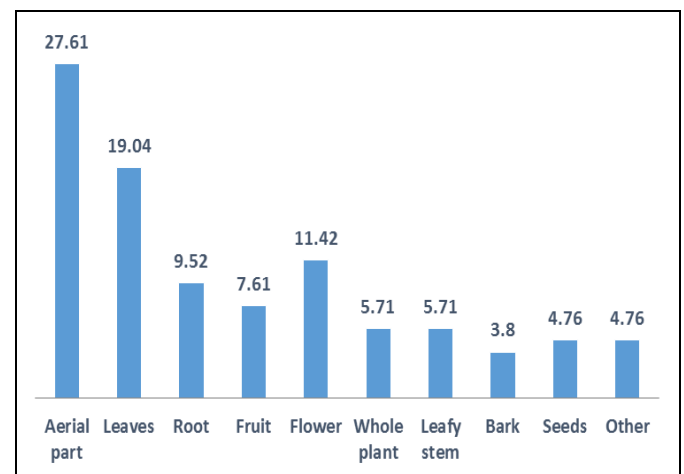


Fig 4: Percentage of used plant parts

3.4 Methods of preparation of plant remedies and route of administration

According to the survey conducted, the plants are prepared in several forms for curing various ailments, ranging from simple to highly complicate. The various forms included decoction (55%), infusion (22, 68%), poultice (13, 44%), powder (11, 76%), raw (4, 2%), maceration (3, 36%), baked (3, 36%) and others (inhalation, fumigation, etc.) (5, 04%) (Figure 5). However, in the present study decoction constitutes the highest type of preparation form, followed by infusion. The results obtained also showed that administration of remedies is done in various forms. A majority of remedies are administered orally (55, 07%) (Figure 6). This is because of the fact that most of the medicinal plants recorded in the study area are used to treat

digestive system disorders and metabolic diseases as shown in Figure 3. Other authors also reported that traditional remedies are mostly administered orally [6, 25, 26]. Tea or coffee served mainly as solvents and to improve the acceptability of certain oral remedies. Olive oil and honey are often used to prepare mixtures for both external application and oral administration.

Also, depending on the nature of the ailment, the same plant can be used both orally and externally.

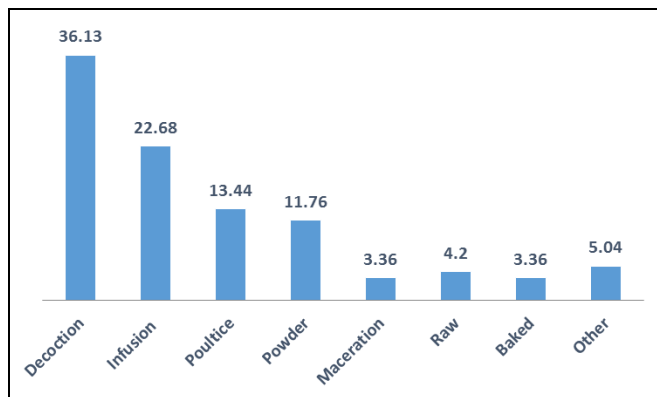


Fig 5: Percentage of different preparation methods of treatment plants

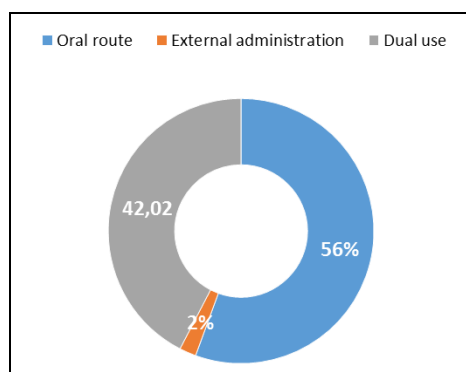


Fig 6: Routes of administration and percentage of medicinal plants.

4. Conclusions

The population of Central Middle Atlas of Morocco makes use of a wide array of medicinal plants distributed in all use categories with predominance of those use in the treatments of digestive system disorders and metabolic diseases.

The therapeutic potential of a few plants widely used by the population of the region have been scientifically proved and therefore are promising for the discovery of new drugs. However, there are many of these plants species whose medicinal uses are yet to be scientifically validated and thus constitute an unexplored terrain for future pharmacological studies.

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