

Original Article

Ethnobotanical Survey of Medicinal Plants used in the Treatment and Care of Hair in Karia ba Mohamed (Northern Morocco)

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ABSTRACT

great interest is given to the medicinal plants, which constitute an invaluable wealth for most of the inhabitants of karia Ba Mohamed and its regions. To identify and evaluate the aromatic and medicinal plants, traditionally used in the region, to treat and care for the hair; we conducted an ethnobotanical survey of 100 people of different ages and sexes using a questionnaire in order to collect as much information as possible on the therapeutic uses practiced. The results found have identify dozens of species of medicinal plants; most of them are used for the treatment and care of the hair. The data obtained was analyzed by specific quantitative indices such as frequency citation (FC), relative frequency of citation (RFC) and family importance value (FIV). A total of 42 species were identified and divided into 28 families. The most cited families are the Lythraceae (FIV=0.700); Rosaceae (FIV=0.560); Zygophyllaceae (FIV= 0.460); Lamiaceae (FIV = 0.360); Papaveraceae (FIV = 0.330) Alliaceae (FIV = 0.290). Among the most used species, we note *Origanum compactum* Benth, *Rosa centifolia* L., *Allium cepa* L., *Allium sativum* L., *Matricaria chamomilla* L., *Lawsonia inermis* L., *Peganum harmala* L. These plants have been identified and presented considering the part used and the preparation method. These results provide a database for further studies to assess these plants' biological and chemical potential in phytochemistry and pharmacology.

INTRODUCTION

Throughout civilizations, hair plays an important role for the human being. In addition to aesthetics, since it is undoubtedly one of the attributes of beauty, it is a symbol of strength and virility in men, and of femininity and seduction in women, hair is a distinctive sign, a kind of personal signature that we distinguish, allowing everyone to assert their personality and can give an indication of our origins, as well as our health. The hair is also present to provide capillary protection of the skull against external aggressions such as heat, UV radiation, cold and many other climatic events. Different hair problems can be occurred, among which we find hair alterations, which corresponds to an anomaly of shape and increases the fragility of the hair: greasy which is saturated with sebum and is the cause of aesthetic discomfort, dry hair, due to a lack of sebum [1] or a color anomaly which is

more frequent and results in a reduction in the activity of melanocytes and leads to the called canities which is probably genetically programmed. Another color anomaly is Leukotrichia. It is a congenital anomaly occurring from birth, it is due to the absence of melanin pigment which can be general or localized. There are two types of leuchtotrichia: Albinism and Piebaldism. These two conditions are characterized by a normal number of melanocytes but a decrease in the production of melanin [2]. Each individual synthesizes different melanins and therefore has their own hair color, but it can be changed according to the age. Indeed, the hair becomes darker after birth, and whitens from the age of 35 [3,4]. Among the most frequent pathologies that can affect the scalp are fungal dermatoses, of which ringworm of the scalp is the most common in Morocco; parasitic dermatoses (pediculosis, scabies) [5,6], and multiple types of

alopecia: diffuse acquired alopecia [7,8] localized acquired alopecia [7-9]. Many factors can cause this alopecia, namely: hormonal, genetic, psychological, drug disorders; food; severe tiredness...

Physical appearance is very important, and is a daily concern for both women and men. Many studies [10,11] linked hair loss to low self-esteem. Men with alopecia are often viewed by others as less confident. This is why scientists believe that prompt treatment is mandatory to delay permanent hair loss as much as possible. With all these hair problems, people are always looking for effective, less expensive and free of side effects, hence the use of natural products as care for their hair.

In order to collect the information concerning the therapeutic uses of medicinal and aromatic plants practiced in the region of Karia Ba Mohamed, which is characterized by a rich and diversified flora, we conducted an ethnobotanical study whose objective is to translate the knowledge and know-how of the population in scientific knowledge in the field of hair treatment and care.

Overview of the Study Area

Karia Ba Mohamed is a Moroccan city in the province of Taounate, in the region of Fez Meknes, located in northern Morocco 58 km from Fez city, and 90 km west of Taounate city. (Fig.1) It is made up of a circle of 9 rural communes: Bni Snous; Loulja; Jbabra; Bouchabel.; Mkansa; Moulay Bouchta; Moulay Abdelkrim; Sidi El Abed; and Rhouazi. on 34.3631 of Latitude, -5.21225 of Longitude and 167 m of Altitude with a population of 134923 people according to the 2014 census of the High Commission for Planning, Kingdom of Morocco.

The economy of the region is based on natural resources and mainly agriculture and livestock, which employ the majority of the rural population, considered one of the best agricultural areas in the province. The climate is Mediterranean, with wet and cold winters alternating with hot and dry summers. The average monthly temperatures vary between 5 °C and 20 °C minimum, and 17 °C and 40 °C maximum.

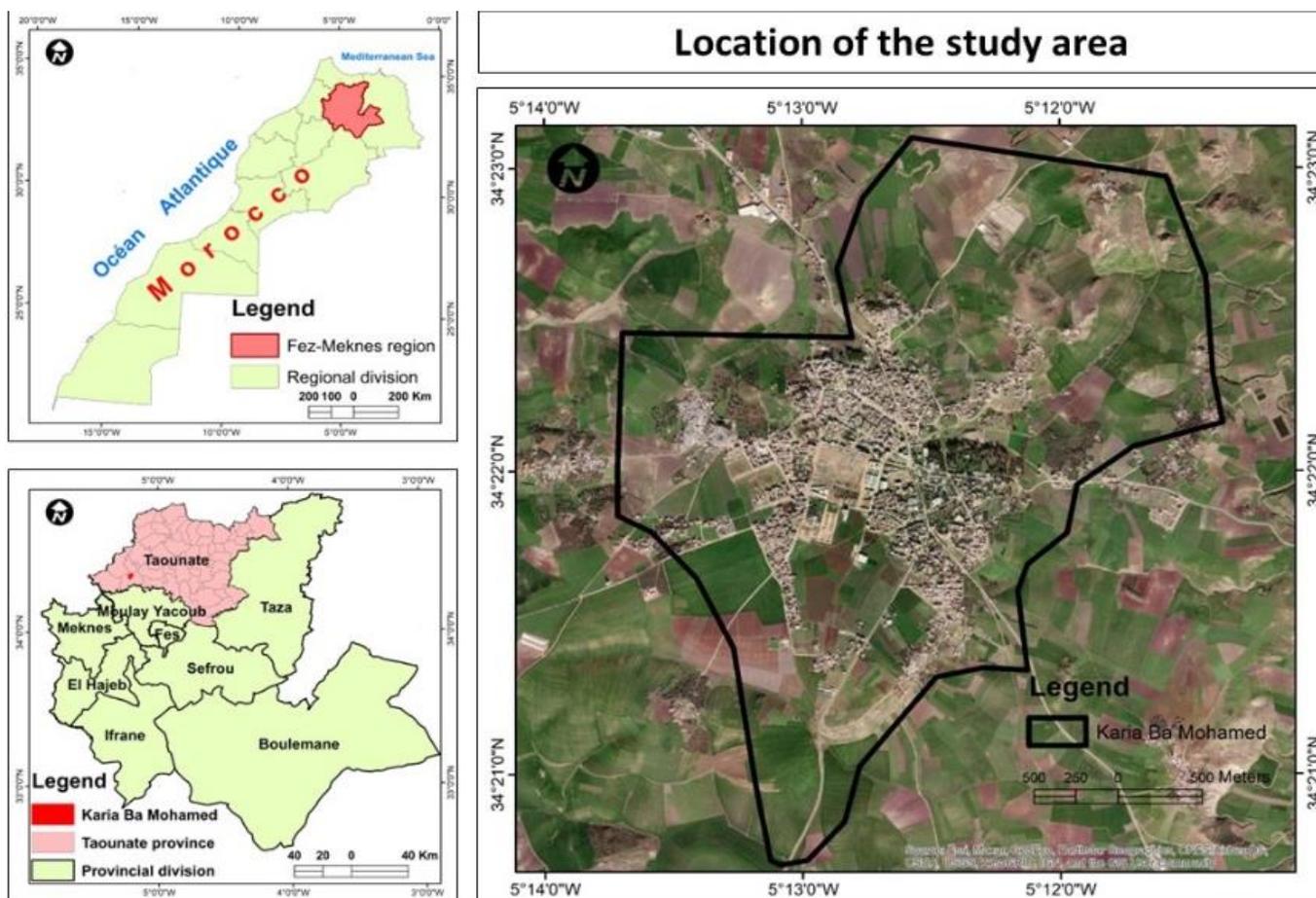


Fig. 1 The study area in northern Morocco (Karia Ba Mohamed)

MATERIALS AND METHODS

Ethnobotanical Survey

The ethnobotanical study focuses on the empirical knowledge of indigenous populations with regard to commonly used medicinal plants, it adds additional ethnographic information such as the vernacular names of the plants, the possible uses and the preparation methods. Our ethnobotanical survey was carried out in the field, by directly contacting the holders of traditional knowledge using a questionnaire to collect information on the citizen (age, gender, level of study, etc.) and on the plants used, their vernacular identities, the part used, and the inventory of some traditional recipes used in hair care in the region studied. The questionnaire developed was inspired indigenous by the work of several authors [12-16]. The surveys are carried out with dialectal Arabic in 10 douars located near Karia Ba Mohamed and 2 weekly souks for this, we interviewed 100 people, herbalists and practitioners. Informed consent was obtained orally from all respondents. The data was collected confidentially and anonymously. All respondents were informed of the purpose of the study and that their information was for scientific study only and not for commercial purposes.

Analysis of Ethnobotanical Data

The data collected are inserted and recorded, they have been analyzed by specific quantitative techniques used in similar studies [14-17]; such as: Frequency Citation (FC), Relative Frequency of Citation (RFC) and Family Importance Value (FIV). The Frequency Citation (FC) is a good indicator for evaluating the credibility of the information received and the level of knowledge of plants by the population surveyed [18]. The Frequency Citation (FC) of a species corresponds to the number of respondents who mentioned the species. While, the Relative Frequency of Citation (RFC) allows the classification of plant species according to their importance, based on the percentage of informants citing a species; the value of RFC was determined according to the following formula: $RFC = FC/N$ with $(0 < RFC < 1)$. With: N is the total number of people questioned [19-21]. The species with a very significant relative frequency of mention are those with a high level of use. The Family Importance Value (FIV) was used to identify the significance of wearing of veils or headscarves by women.

families. It is an index of cultural importance that can be applied in ethnobotany to assess the biological taxonomic value of a plant. To calculate the FIV, we use the following formula: $FIV = FC \text{ family} / N_s$ where FC family is the number of informants mentioning the family and N_s is the total number of species in each family [20].

RESULTS AND DISCUSSION

Description of the Population Surveyed

The respondents are people born and lived in the region studied, they are serious and aged between 20 and 65 years, the age category of more than 30 years represents the majority of users of medicinal plants. These results showed that older people have more ethno-medical knowledge than younger people. Knowledge of medicinal plants and their therapeutic properties is generally acquired through long experience acquired with age (Table 1). The dissemination of this knowledge is currently under threat, as it is not always guaranteed [22]. In this study, the distribution of respondents by gender showed a predominance of women, 80% female compared to 20% male. This female predominance can be explained by their attachment to all that is traditional, and by the fact that the women take care of the recipe's preparation for the care of their hair as well as that of their families. This confirms the results of other studies, which have shown that women have more knowledge in traditional herbal medicine [16, 23, 24]. Regarding the academic level, the intellectual levels are different. However, most of the people surveyed are illiterate (63%), the remaining people were divided between primary (20%) and secondary (10%) schooling and only 7% of the respondents are academics. For the family situation, 70% of the population studied is married against 20% who is single, while 7% of people are divorced and 3% are widowed.

Capillary Problems in the Study Area

According to our survey, the residents of the Karia Ba Mohamed region suffer from several hair problems. These include dandruff, which affects 21% of women and 8% of men also ringworm which mainly affects men, hair loss, which both sexes suffer from, it is one of the most common problems and canities used to designate the whitening of the hair; it occurs naturally with age. These problems can have various etiologies, in particular the climate of the region, the diet or the

The Medicinal Plants used

Table 1 General user profile

Characteristics	Percentage
Age:	-
<30 year	23%
[30-50]	47%
[50-65]	30%
Sex:	
Women	80%
Men	20%
Educational level:	
Illiterate	63%
Primary	20%
Secondary	10%
University	7%
Family situation:	
Married	70%
Single	20%
divorce	7%
widower	3%

In the study area, most respondents reported using traditional medicine for therapeutic and cosmetic purposes. They constitute precious resources for the vast majority of the population. This can be explained by the fact that the region of Karia Mohamed is endowed with a great wealth of aromatic and medicinal plants and that the population has great ancestral know-how in phytotherapy. In addition, since most of the people interviewed have a low socioeconomic level, the costs of care in the health centers are beyond their means.

All the plants identified are presented in Table 2, which includes: the scientific name, the vernacular name, the botanical family, the frequency of citation, the relative frequency of citation (RFC) and the value of the importance of the family. (FIV) for each of them.

The inventory of aromatic and medicinal plants used by the population in Karia Ba Mohamed for the treatment and care of hair has identified 42 plant species belonging to 28 botanical families. (Fig. 3). 76.19% of the plants listed constitute local products and only 23.8% are purchased at the souk. Almost all the plants used are spontaneous species and some plants (17%) are grown in the study area. For the existing 28 families, the most representative is the Lamiaceae (6 species or 14.8%) the Myrtaceae (3 species or 7.14%).



Rosa centrifolia L.



Opuntia ficus-indica (L.) Mill.



Ziziphus lotus (L.) Lam.



Papaver rhocas L.

Fig. 2 Pictures of plants in the study area

According to the FIV index, the most cited families are the *Lythraceae* (FIV=0.700); *Rosaceae* (FIV=0.560); *Zygophyllaceae* (FIV= 0.460); *Lamiaceae* (FIV = 0.360); *Papaveraceae* (FIV = 0.330) *Alliaceae* (FIV = 0.290). This high proportion could be explained by the high efficiency of the plants of these families for the treatment and care of the hair of the population as well as the abundance of these species in the region studied.

The most used plant species by local people to treat and care their hair are:

Origanum compactum Benth (Zatar): The leaves in infusion or decoction, are used to fortify, color the hair, also known for its anti-hair loss use. *Lawsonia inermis* L. (Henna): used for centuries by Moroccan women, the paste of this plant prepared from the powder of the leaves, dried, pulverized and mixed with water is used in local application to strengthen, revitalize, color and restore shine to the hair, it is also renowned for its anti-hair loss and anti-dandruff use.

Rosa centrifolia L. (Alward) (Fig. 2): the leaves in infusion or decoction, or dried and pulverized used alone and mixed with olive oil, with *Lawsonia inermis* L or with *Peganum harmala* L. used as an anti-dandruff treatment for hair loss and can stimulate growth, and promote hair growth. *Rosmarinus officinalis* L. (Azir): the leaves, in infusion or decoction, are used against hair loss. *Peganum harmala* L. (Lharmel): the powder of the seeds mixed with water is very effective in limiting hair loss. *Matricaria chamomilla* L. (Lbabounj): the paste of this plant prepared from the powder of the

aerial part, dried, pulverized and mixed with water is used in local application to dye the hair. *Marrubium vulgare* L. (Mriwta): in decoction, infusion or raw used to beautify the hair.

Allium cepa L. (bsla): Crushed onion bulb stimulates hair growth. And mixed with honey beneficial for baldness.

Allium sativum L. (Touma): Garlic is used raw in various preparations for external use in cases of alopecia. *Capsicum frutescens* L. (Felfel harr): Chilli powder, mixed with garlic and olive oil is used topically against ringworm of the scalp. *Papaver rhoeas* L. (Blamane); *Punica granatum* L. (Rmane); *Camellia sinensis* (L.) Kuntze.(Atay); *Hibiscus sabdariffa* L. (Lkarkadé), *Daphne gnidium* L. (Lzaz); *Turmeric Longa* L (Kharkoum); *Pinus halepensis* Mill.(Tayda): Widely used for coloring hair. *Eucalyptus camaldulensis* dehn. (Kalitou), *Urtica dioica*L. (Hriga), *Urtica urens*L. (Hriga), *Borago officinalis* L. (ħorricha) *Echium horridum* batt. (ħorricha), *Arundo donax* L. (Lqsb): Are species that are identified for the first time for the treatment of hair, used as anti-dandruff and anti-hair loss treatment.

leaves are the most used parts with a rate of 35.71% followed by the aerial part (21.43%), the Seed (9.52%) (Fig. 4).

The high use of leaves followed by the aerial part of the plant can be explained by the ease and speed of harvesting, by the fact that they are rich in active principles, also by the seat photosynthesis and sometimes the storage of secondary metabolites responsible for the biological properties of the plant [27]. These parts of the plant are, in most cases, used dried since they are not available all year round. The drying, then the conservation is done away from light; this allows the preservation of the majority of the active principles of the plants [28]. The modes of preparation used are the poultice, the infusion and the decoction (Fig. 5), the latter are excellent extractors of secondary metabolites, they make it possible to collect the most active principles that they contain the medicinal plants and reduce the toxic effect of certain recipes [29]. Regarding the mode of administration, these remedies are used externally (painting, massage, rinsing, etc.).

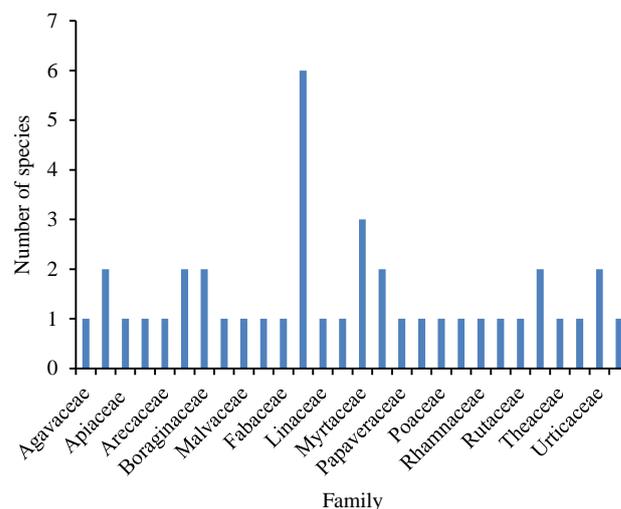


Fig. 3 Number of species reported by family

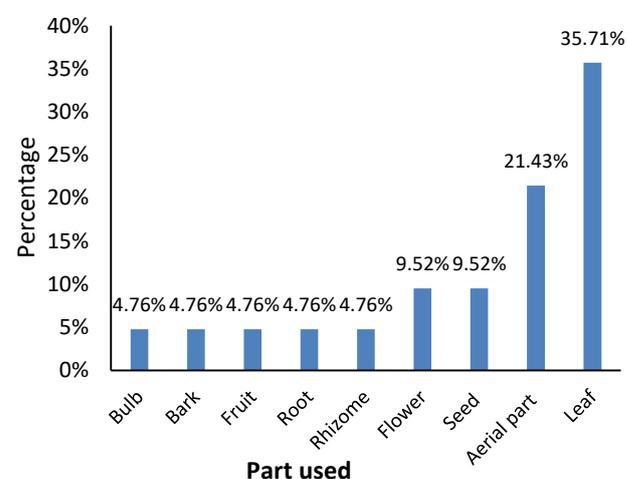


Fig. 4 Proportion of different plant parts used in hair treatment

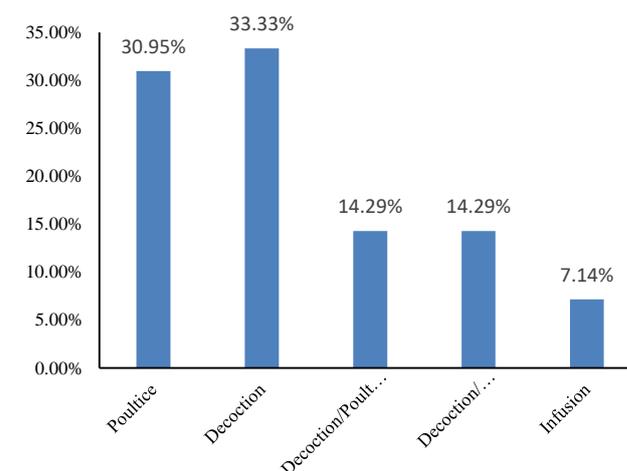


Fig. 5 Breakdown of uses medicinal plants according to the preparation method

Table 2 List of aromatic and medicinal plants used for the treatment and care of hair identified in the territory of Karia Ba Mohamed (Northern Morocco)

Scientific name	Family	Common name	Part used	Preparation form	Frequency of citation	RFC%	FIV%
	Agavaceae						0.020
<i>Agave americana L.</i>		Sabra	Aerial part	Poultice	2	0.02	
	Alliaceae						0.290
<i>Allium cepa L.</i>		Bsla	Bulb	Poultice	33	0.33	
<i>Allium sativum L.</i>		Touma	Bulb	Poultice	25	0.25	
	Apiaceae						0.150
<i>Petroselinum sativum</i>		Madnous	Aerial part	Decoction	15	0.15	
	Apocynaceae						0.020
<i>Nerium oleander L.</i>		Dfla	Aerial part	Decoction	2	0.02	
	Arecaceae						0.140
<i>Chamaerops humilis L.</i>		Dum	Aerial part	Poultice	14	0.14	
	Asteraceae						0.230
<i>Matricaria chamomilla L.</i>		Lbabounj	Aerial part	Decoction	44	0.44	
<i>Atractylis gummifera L.</i>		Dad	Root	Decoction	2	0.02	
	Boraginaceae						0.010
<i>Borago officinalis L.</i>		Horricha	Aerial part	Decoction	1	0.01	
<i>Echium horridum batt.</i>		Horricha	Aerial part	Decoction	1	0.01	
	malvaceae						0.120
<i>Hibiscus sabdariffa L.</i>		Lkarkadé	Aerial part	Infusion	12	0.12	
	Cactaceae						0.100
<i>Opuntia ficus-indica (L.) Mill.</i>		Hndia	Leaf	Poultice	10	0.1	
	Cupressaceae						0.080
<i>Tetraclinis articulata (vahl) mast.</i>		Arar	Leaf	Decoction	8	0.08	
	fabaceae						0.150
<i>Trigonella foenum-graecum</i>		Lhlba	Seed	Poultice	15	0.15	
	Lamiaceae						0.360
<i>Ocimum basilicum L.</i>		Lhbaq	Leaf	Infusion	6	0.06	
<i>Marrubium vulgare L.</i>		Mriwta	Leaf	Decoction/ Poultice	40	0.4	
<i>Salvia officinalis L.</i>		Salmia	Leaf	Decoction	23	0.23	
<i>Rosmarinus officinalis L.</i>		Azir	Leaf	Decoction	51	0.51	
<i>Lavandula officinalis L.</i>		Lkhzama	Flower	Infusion	19	0.19	
<i>Origanum compactum benth</i>		Zatar	Leaf	Decoction/ infusion	77	0.77	
	Linaceae						0.130
<i>Linum usitatissimum L.</i>		Zriat el ketan	Seed	Décoction	13	0.13	
	Lythraceae						0.700
<i>Lawsonia inermis L.</i>		Henna	Leaf	Poultice	70	0.7	
	Myrtaceae						0.083
<i>Eucalyptus camaldulensis dehn.</i>		Kalitou	Leaf	Decoction/ Poultice	4	0.04	
<i>Myrtus communis L.</i>		Rihane	Leaf	Decoction/ Poultice	18	0.18	
<i>Eugenia caryophyllata</i>		Qrnfl	Flower	Decoction	3	0.03	
	Oleaceae						0.025
<i>Olea europea L. Var. oleaster</i>		Zaytoun albari	Leaf	Decoction	2	0.02	
<i>Olea europea L. Var. Sativa</i>		Zaytoun	Leaf	Decoction	3	0.03	
	Papaveraceae						0.330
<i>Papaver rhoeas L.</i>		Blamane	Flower	Decoction, Poultice	33	0.33	
	Poaceae						0.030
<i>Arundo donax L.</i>		Lqsb	Root	Poultice	3	0.03	
	Punicaceae						0.270
<i>Punica granatum L.</i>		Rmane	Bark	Decoction, infusion	27	0.27	
	Rhamnaceae						0.150
<i>Ziziphus lotus (L.) Lam.</i>		Sdra	Leaf	Decoction, Poultice	15	0.15	
	Rosaceae						0.560
<i>Rosa centrifolia L.</i>		Alward	Flower	Decoction, infusion	56	0.56	
	Rutaceae						0.020
<i>Citrus limon L.</i>		Limoun	Fruit	Poultice	2	0.02	
	Theaceae						0.130
<i>Camellia sinensis (L.)</i>		Atay	Seed	Decoction, infusion	13	0.13	

Kuntze.							
	Thymelaeaceae						12.000
<i>Daphne gnidium L.</i>		Lzaz	Leaf	Poultice	12	0.12	
	Urticaceae						0.020
<i>Urtica dioica L.</i>		Hriga	Aerial part	Decoction, infusion	2	0.02	
<i>Urtica urens L.</i>		Hriga	Aerial part	Decoction, infusion	2	0.02	
	Zingibéraceae						0.060
<i>Curcuma longa L.</i>		Kharkoum	Rhizome	Decoction	6	0.06	
	Zygophyllaceae						0.460
<i>Peganum harmala L.</i>		Lharmel	Seed	Poultice	46	0.46	
	Solanaceae						0.035
<i>Mandragora autumnalis Mill.</i>		Bid al ghul	Rhizome	Poultice	2	0.02	
<i>Capsicum frutescens L.</i>		Felfel harr	Fruit	Poultice	5	0.05	
	Pinaceae						0.020
<i>Pinus halepensis mill.</i>		Tayda	Bark	Decoction, Poultice	2	0.02	

Parts of PAMs Used

A medicinal plant is defined as any substance in which one or more organs contain substances that can be used for therapeutic purposes or as precursors for the synthesis of antibacterial drugs [25,26]

In traditional medicine, the therapeutic properties vary according to the different parts of the plant used, in particular the leaves, the flowers, the roots, the fruit, the whole plant... In the present study, the

CONCLUSION

In summary, the present work required a survey spread over a period of three months with one hundred people, elderly with a preponderance of the female gender, who answered our questions with pleasure, and enjoy a very great expertise based mainly on their practical experience. This proves the importance of hair cosmetology and traditional herbal medicine for them; but we found that the majority of respondents were unaware of the undesirable effects and the possible toxicity of the plants used. In this study, we estimated the frequency of use of aromatic and medicinal plants in herbal medicine and collected all the information on their traditional practices, to contribute to the preservation of popular knowledge and know-how in the region studied, which has allowed to identify 42 species, divided into 28 families, with the dominance of *Lamiaceae* (6 species or 14.8%) *Myrtaceae* (3 species or 7.14%). According to the FIV index, the most cited families are the *Lythraceae* (FIV=0.700); *Rosaceae* (IVF=0.560); *Zygophyllaceae* (FIV= 0.460); *Lamiaceae* (FIV = 0.360); *Papaveraceae* (FIV = 0.330) *Alliaceae* (FIV = 0.290). Some plants are first identified for hair treatment as *Eucalyptus camaldulensis dehn.* (Kalitou), *Urtica dioicaL.* (Hriga), *Urtica urensL.*

(Hriga), *Borago officinalis L.* (ħorricha) *Echium horridum batt.* (ħorricha), *Arundo donax L.*

The plants identified used as the best way to care for, treat and preserve the vitality and beauty of hair. The parts used for the preparation of the recipes are leaves, roots and barks.

Traditional medicine remains the main means of treating hair problems for the vast majority of the population of Karia Ba Mohamed, as the study area has a high biodiversity with a variety of medicinal plants and requires further exploration for this. This work constitutes just a beginning for other surveys which will have to be carried out in other regions of Morocco.

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