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Traditional Knowledge of Medicinal Plants Used for Cosmetic Purposes in The Fez-Meknes Region

Salhi Nadia*, El Finou Hamza, Halmoune Asma, Zaid Abdelhamid,El Rhaffari Lhoussaine

Laboratory of BioActives Health and Environment, Faculty of Sciences, Moulay Ismail University. Meknes B.P.11201. Morocco.

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ABSTRACT

Ethnobotanical studies have often neglected plants of cosmetic interest, focusing mainly on medicinal or food plants. This study aims to identify the plants used for cosmetic purposes in the Fez-Meknes region of Morocco. 70 herbalists from different towns in the Fez-Meknes region were interviewed individually using a closed and validated questionnaire containing questions on plants used for skin, hair, oral, nail, and underarm care. As well as plants used for the treatment of dermatosis. Use Value (UV), Fidelity Level (FL), and Informant Consensus Factor (ICF) were employed in data analysis. A total of 108 plant species belonging to 50 families have been recorded. The most representative families were Lamiaceae and Fabaceae with 11 species for each, followed by Apiaceae, Asteraceae, and Rosaceae. The majority of medicinal plants were used in hair care (ICF=0.88) and face care treatments (ICF=0.75). High Use Value was recorded for *Lavandulaofficinalis* L. (UV =0.6), *Rosa damascena* Mill (UV =0.6), *Myrtus communis* L. (UV=0.52), and *Matricaria chamomilla L.* (UV=0.45). The most utilized plant part was stated as leaves (26%) followed by seeds (20%) and fruits (12%). They were used as a powder (34 %), or decoction (21 %). This study listed the plants used in cosmetics in the Fez-Meknes region, and the data collected could be used to develop the plant-based cosmetics industry through the isolation and characterization of bioactive molecules from the plant species identified, as well as the preservation of ancestral knowledge.

***Keywords*:** Ethnobotanical, Traditional medicine, Cosmetics, Medicinal plants.

Introduction

Plant-based remedies have been used by women for years to enhance and preserve their beauty.[1] Cosmetic products consist of substances or preparations intended to be applied to the skin, mucous membranes, or teeth of the oral cavity. They can be used to clean, perfume, modify the appearance, eliminate odors, and protect or maintain them in good condition. There are therefore five types of cosmetics: skin care products, make-up, hair care products, and special-use cosmetics.[2]

Medicinal and aromatic plants have been used in ancient times to formulate natural remedies to treat skin ailments and a wide variety of dermatological disorders, such as acne, spots, wound healing, or dermatoses like eczema, psoriasis, and pruritus. They have also been used to stimulate hair growth, in hair colorants and dyes, and in many hair and scalp conditions, such as dandruff. In addition, care of teeth and treatment of oral diseases are also included.[3–6]In fact, natural herbal products are still gaining a great deal of popularity, on the one hand, because of their availability and low cost for poor populations, and on the other because of their safety. Unlike synthetic substances, however, they remain highly suspect due to their high cost and, in some cases, undesirable effects.[7]

Medicinal plants are traditionally used in Morocco in treating skin problems. Historically, Morocco is one of the Mediterranean countries with a long medical tradition and traditional know-how in phytotherapy.[8]

*Corresponding author. E mail: n.salhi@edu.umi.ac.ma
Tel: +(212) 612420206

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There is an accumulation of a rich repertory of plant medicinal use knowledge and associated practices, in which phytotherapy is an integral part of these traditional practices.[4,9,10] Unfortunately, traditional plant knowledge is being lost from one generation to the next. Many factors lead to a rapid loss of traditional knowledge, including migration, acculturation, environmental change, rural-to-urban migration, new media, and the death of older persons.[8] which would make such studies primordial to preserve the ancestral knowledge of populations. In the same context, ethnobotanical studies on medicinal plants' use for cosmetic purposes focus especially on skin care and skin treatment diseases.[11,12] In the Fez-Meknes region, there have only been two ethnobotanical studies of plants used in cosmetics in two towns, Taza and Moulay Yacoub, and no studies have been carried out on a regional scale.[8,13]Clearly, there is a lack of ethnobotanical studies inventorying medicinal plants with cosmetic potential in this region.

To overcome this lack of data, the present study focused on identifying medicinal plants used topically for cosmetic care under the categories of face care, hair care, mouth care, nail care, underarm care, and dermatosis treatments. Thus, the current study can potentially contribute to preserving knowledge in the Fez-Meknes region.

Materials and Methods

Study area

The Fez-Meknes region covers an area of 40,075 km², i.e. 5.7% of the national territory and 13% of the national population. Administratively, it comprises two prefectures, Fez and Meknes, and seven provinces: Boulemane, El Hajeb, Ifrane, Moulay Yaâcoub, Sefrou, Taounate, and Taza. The climate varies between continental, very hot and dry in summer, cold and wet in winter; cold and wet in the mountainous areas, very cold and snowy in winter and temperate in summer; and semi-arid in the high hills of Boulemane. The estimated forest area of the region is 1,246,255 ha, representing 14% of the national surface area (Figure 1).

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Ethnobotanical survey

An ethnobotanical study was carried out from August 2020 to April 2021 among herbalists in the Fez-Meknes region, using a closed questionnaire validated by members of the BioActif Health and Environment Laboratory, Faculty of Sciences, Moulay Ismail University.[14] In this sense, 70 herbalists were interviewed, The survey consisted of three main parts:

Questions on the profile of the respondents, including age (under 25, 25-40, 40-60, and over 60), gender (male and female), level of education (informal, primary, secondary, and university), and source of knowledge (ancestral knowledge, readings or experiences of others).

Questions about plants used for cosmetic purposes, parts used, and method of preparation, including face care, hair care, oral care, nail care, and underarm care.

Questions about plants used for the treatment of dermatosis.

Plant species identification and preservation

The collected plants were identified by Pr. Mohamed Bammou (Moulay Ismail University, Faculty of Science and Technology, Errachidia, Morocco), based on the Practical flora of Morocco and The medicinal plants of Morocco.[15,16] Voucher specimens were deposited at the herbarium of the Laboratory of BioActives Health and Environment, Faculty of Sciences, Moulay Ismail University. Meknes. The scientific names were alphabetically classified according to family names.

Data analysis

The traditional knowledge of the use of medicinal plants in cosmetic applications was analyzed quantitatively using the Frequency of citations, Fidelity Level, Use-Value, and Informant Consensus Factor.

The frequency of citations was determined as follows:

FC (%) = (Number of citations/Total number of citations) *100

Fidelity level (FL) was calculated using the following formula:

FL (%)= (Np/N)*100

Np is the number of informants citing the use of the plant for a particular disease category and N is the total number of informants citing the plant for any disease category.[17]

The use-value (UV) shows the relative importance of species known locally.[18] It was calculated as follows:

UV= number of citations per species/number of informants

Informant consensus factor (ICF) was calculated with the following formula:

ICF = Nur-Nt/Nur-1

Nur refers is the total number of use reports for each category and Nt is the number of taxa used in that category.[18]

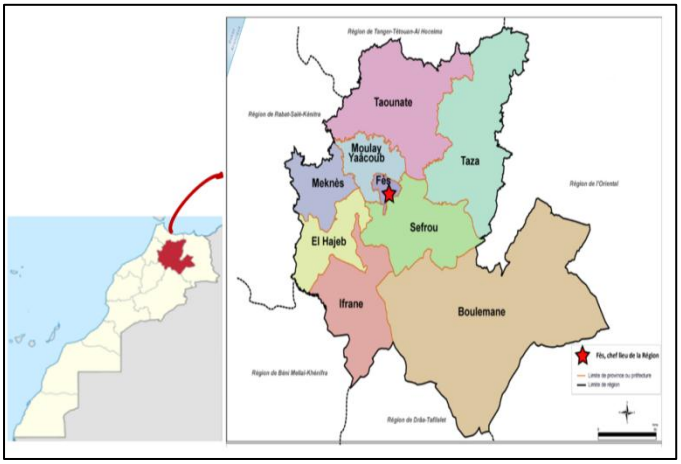

Figure 1: The geographical location of the Fez-Meknes region

Results and Discussions

Sociodemographic data of herbalists and their knowledge source

In the present study, a total of 70 herbalists participated in the survey (Table 1). Most herbalists are aged between 40 and 60 years. Importantly, the majority of surveyed herbalists (88.57%) are men. This reflects the fact that Moroccan culture does not encourage women to enter this type of profession, and as a result, herbalism in Morocco is still a highly masculine domain.[13] The growing use of alternative medicines requires an acceptable level of knowledge of advances in this field. Herbalists must therefore keep abreast of these advances to reassure users of medicinal plants, which requires at least an adequate level of education. In this regard, the level of education of the participants was established. More than half the herbalists (52.86%) had a secondary level of education. This result explains the 20 % of herbalists who acquire their knowledge through reading. However, the majority acquired their knowledge from the traditions inherited from their ancestors. This reflect the fact that traditional practices in this field continue to be passed down from one generation to the next. Similarly, it has been found that the majority of the respondents acquired their traditional knowledge orally from members of their families mainly grandparents and parents.[14,17,19]

The diversity of medicinal plants used for cosmetic purposes

Moroccan flora is characterized by great diversity, of which medicinal plants constitute a remarkable proportion. Geographical and climatic conditions are at the root of this diversity.[3] Many of these plants have been used in traditional Moroccan medicine to treat a variety of diseases, as shown by several ethnobotanical studies carried out throughout the country. The Fez-Meknes region, for its part, has a long tradition of using medicinal plants, as illustrated by ethnobotanical studies conducted in several towns across the region.[8,20-25]

In the present study, we inventoried the medicinal plants with cosmetic properties used in the Fez-Meknes region. Table 2 listed botanical families, scientific names of species, plant parts used, methods of preparation, and cosmetic use. The number of citations and the use value for each plant species are also indicated.

A total of 108 species belonging to 50 botanical families used for cosmetic purposes have been reported by this survey, reflecting the diversity and richness of the plants used for different cosmetic applications by the people of the Fez-Meknes region. Among the families identified, the most represented were Lamiaceae (11 species), Fabaceae (11 species), Apiaceae (7 species), Asteraceae (6 species), Rosaceae (5 species), and Poaceae (4 species). Other plant families were represented by three to one species (Figure 2). The widespread use of these families could be explained by their wide distribution in the Moroccan vascular flora, which is extremely species-rich.[26] The Lamiaceae family is considered one of the most important, well known for its diversity and spectrum of therapeutic properties.[27] It has been cited in numerous ethnobotanical studies as the botanical family whose species are most widely used.[8,13,20] Whereas, both Lamiaceae and Asteraceae families were the most reported families used for treating skin burns,[11] or in other ethnopharmacological surveys.[9,12,26]

Plant parts used and mode of preparation

In the present study, the leaves formed the most frequently used (26 %), followed by seeds (20%), fruits (12%), and whole plants (8%) which have the same frequency as flowers (8%). The frequent use of leaves is linked to their availability, acceptability, and easy preparation. Moreover, photosynthesis takes place in the leaves, and the secondary metabolites that confer medicinal properties on the plant are sometimes stored there.[4] Previous research revealed that in Moroccan traditional medicine, leaves predominate over other plant parts.[12,19,22,29] As in other countries.[18,30]

Powder (34%) and decoction (21%) are the most commonly used preparation methods reported in the present survey, this high frequency can be explained by the strong relationship between preparation mode and administration, where in this case all preparations are used externally. A large number of plants are reported to be used for hair care, the formulations generally contain a mixture

of one or more dried plants in powder form, mixed with the extract of the decoction of other plants and applied to the hair for a duration that depends on the formulation used. Or in some cases, decoction extracts are used to wash the hair or used as a hairspray. In facial care, the powder of many plants is also used and applied as a mask to the face. Powders have also been reported to be easier to prepare, with the advantage of a lower risk of contamination than other preparation methods.[30] These results are in line with other studies conducted in different areas of Morocco.[11,31]

Use value (UV)

To determine the relative importance of each plant species used to treat different disorders in traditional medicine, the use value index (UV) was calculated. In the present study, the use value ranges from 0.01 to 0.6 (Table 2). *Lavandula officinalis* L. and *Rosa damascena* Mill. were the plant species most highly cited by herbalists as being used for cosmetic purposes by the population of the Fez-Meknes region. The higher use value of these two species could be explained by their wide range of use since they are cited for at least two disorders. *Lavandula officinalis* L. is cited for hair loss and hair growth, as well as for wound healing and as an antiperspirant. It is also used to treat dermatological problems such as eczema, onychomycosis, and cutaneous mycosis. It has also been cited in other studies.[22,32]*Lavandula* has other therapeutic uses, the decoction extract is used against coughs, the infusion extract of the flowers in combination with *Artemisia herba alba* and *Cinnamomum zeylanicum* is indicated in the treatment of genito-urinary disorders,[33] kidney diseases, [32]as it has digestive and relaxing effects.[22]

Rosa damascena Mill. is used for its skin moisturizing, wound healing, and acne treatment properties. Mixed with toutia and mesk, it is used as an antiperspirant, alternatively, with other plant species to prevent hair loss and promote hair growth. Mixed with ghasul, the hydrolat is used to treat chloasma. These properties were also indicated in several other studies conducted in Morocco. It is used for hair care and as a hair tonic,[35] for face care.[13,36] Other therapeutic uses were indicated, the flowers are used as a poultice to relieve headaches.[37] The rose oil, and rose absolute were used more commonly in perfumery.[5,38] Beta-damascenone, beta-damascone, and beta-ionone are the main aromatic compounds that contribute to the distinctive scent of *Rosa damascena* Mill.

Frequency of citation (FC) and Fidelity level (FL)

Based on the frequency of citations of each plant species used for hair care (Table 5), *Myrtus communis* L. is the most plant species used for hair care (6.1 %), followed by *Lavandula officinalis* L. (5.93 %), *Matricaria chamomilla L*. (5.23 %), *Daphne gnidium* L. (4.71 %), *Lawsonia inermis* L. (4.36 %), *Rosmarinus officinalis* L. (4.18 %), *Rosa damascena* Mill. (3.83 %) , and *Hibiscus sabdariffa* L. (3.66 %).

The fidelity level of these frequently cited plants was also calculated (Table 4). *Myrtus communis* L. (94.59 %) was used as a powder mixed with *Lawsonia inermis* L. and other plants such as *Punica granatum* L., *Juglans regia* L., and *Hibiscus sabdariffa* L. for coloring hair, hair loss, and dandruff. It is also used for wound healing and as a decoction or infusion for oral care. Several ethnobotanical studies have also reported the beneficial effect of *Myrtus communis* L. on hair, the powder and oil poultice is applied to hair and scalp to protect against hair loss,[39] or mixed with henna for treating hair,[35,40] and hair loss.[41,43] Its usage for wound healing was also reported.[44]*Lavandula officinalis* L. (80.95 %) has also been cited as being used for hair care.[8,45]*Matricaria chamomilla L*. (93.75 %) plays an important role in protecting hair against loss and stimulating hair growth, this effect was cited also by several studies.[4,46] It helps skin brighten up and is used to heal wounds.[35]*Daphne gnidium* L. (100 %) is used as a natural detangler and protects also against hair loss. In other studies, it was used for hair care and hair strengthening.[41]*Lawsonia inermis* L. (100 %) called l'hana, is a very well-known plant species, cultivated in several regions of Morocco. [3] Its use for hair care is very popular among Moroccan women. It has been described in several ethnobotanical studies conducted throughout Morocco.[3,34,47,48] Generally, most of the plant species listed for hair care are not used on their own, but in a mixture of several plants. The synergistic effect of several plants produces the best-desired hair care results.

The skin, the largest organ in the body, serves a variety of vital roles, including protecting the body from harm or injury via interfaces with the external environment. This makes this organ extremely susceptible to numerous changes that might harm the skin in many ways, resulting in a variety of dermatological conditions such as wounds, eczema, dermatitis, psoriasis, and general skin diseases. In this study, several plant species were identified as having skin-care properties. The most frequently cited plants for this purpose are shown in Table 4, where *Rosa damascena* Mill. (11.11 %) is in the first rank. It has been used for wound healing, skin moisturizing, and for the treatment of acne and chloasma.

Table 1: Summary of herbalists' sociodemographic data

Characteristics	Number (N=70)	Percentage (%)
Age		
25-40	20	28.57
40-60	44	62.85
<60	6	8.57
Sex		
Male	62	88.57
Female	8	11.43
Level of education		
Informal	7	10.00
Primary	21	30.00
Secondary	37	52.86
University	5	7.14
Knowledge source		
Ancestral knowledge	66	74.16
Reading	17	19.10
Others' experiences	6	6.74

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Table 2: List of plants used for cosmetic purposes in the Fez-Meknes region

Family	Scientific name (*Voucher*)	Vernacular name	Parts used	Mode of preparation	Cosmetic use	Number of citation	Use value (UV)	References
Amaryllidaceae	*Allium cepa* L. BAHE36	Bessla	Bulb Seed	Decoction Raw Seeds	Nourishes strengthens, and promotes hair growth	11	0.15	[37]
	Allium sativum L. BAHE37	Tichart/ Atouma	Bulb Leaves	Oil Raw	Hair loss Dandruff Onychomycosis Eczema	13	0.18	[3,35,37]
Anacardiaceae	*Pistacia atlantica* Desf. BAHE38	btam/ Meska hora /lhaba lkhadra	Seeds Resins Leaves	Decoction Powder	Wound healing Tooth cleaning, and whitening	4	0.05	[3,4]
Apiaceae	*Ammi majus* L. BAHE39	Atrilal/ Trillane	Fruits Stem Aerial Part Leaves	Infusion Decoction Powder	Vitiligo	1	0.01	[3,7]
	Ammi visnaga L. Lam. BAHE40	Bachnikha/ khella	Flowers Seeds	Decoction	Tooth cleaning	7	0.1	[28,35,51]
	Coriandrum sativum L. BAHE41	Kasbour	Whole plant Seeds	Decoction Infusion Powder	Hair loss Eczema	1	0.01	[7]
	Daucus carota L. BAHE42	Khizzu	Roots Fruits	Juice	Wound healing Dark eye circles	2	0.02	[3,7,11]
	Foeniculum vulgare Mill. BAHE43	Naffea	Seeds	Powder	Hair loss	2	0.02	[7]
	Magydaris panacifolia (Vahl) Lange BAHE44	F'rifra	Fruits	Decoction Powder	Hair care Hair loss	10	0.14	[3,52]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

	Petroselinum sativum Hoffm BAHE45	Maadnous	Whole plant Seeds	Decoction Infusion Maceration Powder	Brightening Acne Hair loss	1	0.01	[7]
Arecaceae	*Cocos nucifera* L. BAHE46	Jawz lhind/l'kouk	Fruits Seeds	Oil	Emollient, skin moisturizer, and softener Hair nourishing and smoothing	3	0.04	-
Asphodelaceae	*Aloe vera* L. Burm.f. BAHE47	Sbar	Leaves	Raw	Brightening and cleaning the skin Detangles and promotes hair growth	12	0.17	[7]
Asteraceae	*Artemisia herba-halba* Asso. BAHE48	Chih/izri	Leaves Whole plant	Decoction Infusion	Wound Healing Teeth cleaner	4	0.05	[7,11]
	Calendula officinalis L. BAHE49	Jemmra	Whole plant Flowers	Decoction Infusion Maceration	Acne Skin infection Wound healing	1	0.01	[3,13]
	Atractylis gummifera L. BAHE50	Addad	Roots Whole plant Aerial part Leaves	Decoction Powder	Evens colour, exfoliates, eliminates brown spots Hair loss Acne Dandruff Eczema	1	0.01	[3,7]
	Helianthus annuus L. BAHE51	Nwar chams	Seeds	Oil	Wrinkle UV protection	1	0.01	[3]
	Inula viscosa L. Aiton BAHE52	Terrahla/magraman	Stems Flowers Roots	Decoction Infusion Powder	Tooth whitening and cleaning	4	0.05	[25]
	Matricaria chamomilla L.	Elbabonj	Flowers Leaves	Infusion Decoction	Brightening, Dark eye circles Hair loss and promotes hair	32	0.45	[7,12]

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	BAHE53			Powder	growth			
Brassicaceae	*Eruca sativa* Mill. BAHE54	Jarjir	Leaves	mixed with olive oil	Hair loss Anti-aging	1	0.01	[7]
	Lepidium sativum L. BAHE55	Hebb Rchad	Seeds	Powder	Nourishes strengthens and promotes hair growth Hair loss Dandruff	2	0.02	[3,43]
Burseraceae	*Boswellia carterii* Bridw. BAHE56	Luban dakar	Resin	Infusion	Brightening Acne Chloasma	5	0.07	[3]
Brachytheciaceae	*Homolothecium aureum* Lagasca, B.E BAHE57	Assenbal	Aerial part	Mixed with other plant samples	Hair loss	14	0.2	[3,43,53]
Cactaceae	*Opuntia maxima* Miller. BAHE58	L'handiya	Leaves Seeds	Powder Oil Gel	Moisturizing Anti-aging Regenerating, restores skin firmness and tone Wound healing Fortify nails Hair care Hair loss	7	0.1	[3,12]
Cannabaceae	*Cannabis sativa* L. BAHE59	El-kif	Leaves Seeds	Powder of dried leaves Oil	Hair care, hair loss, and promotes hair growth Wrinkle	11	0.15	[7,13]
Capparaceae	*Capparis spinosa* L. BAHE60	Lkbbar	Fruits Flowers Leaves Seeds Whole Plant Stems	Decoction Maceration Oil Powder	Acne Hair loss Dandruff	2	0.02	[4]
Combretaceae	Triticum turgidum L. BAHE61	Zraa	Buds	Oil	Skincare	1	0.01	[7,13]

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ISSN 2616-0692 (Electronic)

Cucurbitaceae	*Citrullus lanatus* (Thunb.) Matsum. & Nakai BAHE62	Dallah	Fruits	Juice	Promotes hair growth	1	0.01	-
	Cucumis sativus L. BAHE63	Lkhiar	Fruits Seeds	Cataplasm Oil	Dark eye circles Fortify nails Hair care, nourishing, softness and luster.	5	0.07	[7,37]
	Cucurbita maxima Duchesne. BAHE64	Garaahamra	Seeds	Oil Powder	Nourishes strengthens, and promotes hair growth	2	0.02	[7]
Cupressaceae	*Tetraclinis articulata* (Vahl) Mast BAHE65	L'aaraar /san-drous	Leaves	Decoction Infusion Powder Mask	Hair loss Face care	10	0.14	[3,9]
	Juniperus oxycedrus L. BAHE66	Taqqa/ Katran	Wood	Oil	Hair colouring and hair loss Eczema	4	0.05	[3,4]
Cyperaceae	*Cyperus rotundus* L. BAHE67	Tarra/nabat saad	Rhizome	-	Hair loss	12	0.17	[3,4]
Euphorbiaceae	*Euphorbia officinarum subsp. echinus* (Hook.f. & Coss.) Vindt BAHE68	Daghmûs	Stems	Powder Raw	Eczema	1	0.01	[3,7]
Fabaceae	*Acacia nilotica* (L.) Willd. ex Delile BAHE69	Sllaha	Fruits	Powder	Toothache Tooth whitening and cleaning	6	0.08	[7,43]
	Acacia raddiana Savi. BAHE70	Talh el hor	Leaves Resin	Powder Lotion	Burn Wound healing	3	0.04	[3,37]
	Cassia senna L. BAHE71	Sanna-hram, Sanna mekka	Leaves Fruits	Powder	Hair care Pruritus	1	0.01	[34]

ISSN 2616-0684 (Print)
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	Cicer arietinum L. BAHE72	Lhemmes	Seeds Fruits	Powder Mask	Lightening Skin infection Acne Chloasma	17	0.24	[12,13]
	Faidherbia albida (Delile) A.Chev BAHE73	Mimouza/ lyag	-	-	Hair colouring	2	0.02	-
	Glycine max L. BAHE74	Soja	Seeds	Powder Oil	Skincare Anti-aging	3	0.04	[7]
	Glycyrrhiza glabra L. BAHE75	Aar'ksous	Root	Decoction Powder	Lightening Skincare Teeth care	2	0.02	[34,46]
	Lupinus albus L. BAHE76	Tirmis/foul gnawi mor	Seeds	Powder	Anti-aging Lightening Skincare	6	0.08	-
	Melilotus indicus (L.)All. BAHE77	Azroud	Fruits	Decoction	Hair care	10	0.14	[3,7]
	Trigonella foenum-graecum L. BAHE78	Lhalba	Seeds	Infusion Maceration Powder	Lightening Skin infection Acne Hair colouring and hair loss Dandruff	17	0.24	[3]
	Vicia faba L. BAHE79	Foul	Seeds	Powder Mask	Cleaner and scrubber Wound healing	10	0.14	[3,54]
Fagaceae	*Quercus faginea* Lam. BAHE80	Aafss	Galls	Decoction Powder	Hair care Tooth cleaning	10	0.14	[3,35]
	Querqus suber L. BAHE81	Dbagh	Barks	Decoction Infusion Powder	Hair colouring and hair loss Tooth cleaning Wound healing	13	0.18	[3,9]

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Gentanaceae	*Erythraea centaurium* (L.) BAHE82	Qasat el-haya	Flowers	Maceration	Wound healing	1	0.01	[3,41]
Iridaceae	*Crocus sativus* L. BAHE83	Zaâfran l'hour	Flowers	Infusion Powder	Brightening Wound healing	2	0.02	[43]
Juglandaceae	*Juglans regia* L. BAHE84	Siwak/Grgaa	Barks Leaves	Decoction Infusion Maceration Raw Powder	Hair colouring Tooth whitening and cleaning	19	0.27	[20,28,43]
Lamiaceae	*Ajuga iva* (L.) Schreb. BAHE85	Chendgura/ Touf-Telba	Leaves Whole plant	Decoction Infusion Powder	Hair loss Tooth cleaning	1	0.01	[43]
	Lavandula officinalis L. BAHE86	L'khzama	Leaves Aerial part	Decoction Infusion Oil	Hair loss and promotes hair growth Wound healing Antiperspirant Eczema Onychomycosis Cutaneous mycosis	42	0.6	[12,13]
	Marrubium vulgare L. BAHE87	Merrîwa	Leaves Aerial Part	Decoction Infusion Maceration Powder	Hair care Eczema	1	0.01	[3,4]
	Ocimum basilicum L. BAHE88	Lhbaq	Flowers Leaves	Decoction Powder	Hair loss Skin infection	1	0.01	[55]
	Origanum compactum Benth. BAHE89	Zaatar/Sahtar	Leaves Aerial part	Decoction Infusion Oil	hair loss, hair colouring Antiperspirant Tooth cleaning Onychomycosis Cutaneous mycosis	27	0.38	[3,37]
	Origanum majorana L.	Merdeddouch	Leaves	Maceration (or	Hair loss, and dandruff	1	0.01	[7,13]

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	BAHE90		Aerial part	with olive oil)				
	Rosmarinus officinalis L. BAHE91	Azir	Leaves Whole Plant	Decoction Infusion Oil Powder	Hair loss, dandruff, and promotes hair growth Wrinkles	28	0.4	[3,7,9,31,35,55]
	Salvia officinalis L. BAHE92	Salmia	Leaves Aerial part	Decoction Infusion Powder	Hair loss, and dandruff Hair colouring	16	0.22	[7,31,53]
	Salvia verbenaca L. BAHE93	Lkhiyata	Leaves Whole plant Aerial part	Infusion Maceration Powder Raw	Wound healing Abscess	7	0.1	[3,4,37]
	Thymus zygis L. BAHE94	Zeitra	Leaves Aerial part	Decoction Infusion Powder	Hair loss	3	0.04	-
	Vitex agnus-castus L. BAHE95	El-kharwaa	Seeds	Oil Powder	Nail care Hair loss Hair care Anti-aging Onychomycosis	12	0.17	[7,37]
Lauraceae	*Cinnamomum cassia* (L.) Presl BAHE96	L'qarfa	Barks	Oil Powder	Anti-aging Skin lightening Acne Skin infection	2	0.02	[7,12]
	Laurus nobilis L. BAHE97	Waraq sidna moussa	Leaves	Oil Powder	Skin lightening Acne	1	0.01	[34,35]
	Persea americana Mill.	Avoca	Fruits	Oil	Moisturizes and nourishes	3	0.04	[7,42,56]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

	BAHE98			Mask	the skin Acne Dark eye circles Fortify nails			
Linaceae	*Linum usitatissimum* L. BAHE99	Zriaat el katan	Seeds	Decoction Infusion Maceration Powder Oil	Acne Face care Softening Hair loss, and dandruff Detangler	6	0.08	[3,7,13,34,35,53]
Lythraceae	*Lawsonia inermis* L. BAHE100	L'hana	Leaves	Powder	Hair colouring and hair loss Eczema	25	0.35	[3,7,13,34,35,41,47,48,54]
	Punica granatum L. BAHE101	Kchour roman	Barks	Decoction Infusion Maceration Powder	Hair colouring and hair loss Tooth cleaning Periodontal disease	23	0.32	[3,7,37,54]
Malvaceae	*Hibiscus sabdariffa* L. BAHE102	Karkadi/Bissam	Leaves Whole plant Flowers	Decoction Infusion Powder	Hair loss, dandruff, and colouring hair	21	0.3	[7,43]
Myrtaceae	*Eucalyptus globulus* Labill, BAHE103	Kaliptous	Leaves	Decoction	Skincare Cleanser	1	0.01	[7,54]
	Myrtus communis L. BAHE104	Rihane	Leaves Aerial part	Decoction Infusion Powder	Hair loss, dandruff, and colouring hair Skin infection Wound healing Tooth cleaning Eczema	37	0.52	[8,19,25,35,42,44,53]
	Syzygium aromaticum (L.) Merr & L.M.Perry BAHE105	Aoud anwar/ Qronfal	Flower Buds	Decoction Infusion Powder	Tooth whitening and cleaning Hair loss, and strengthening	27	0.38	[7,8,10,13,35,43]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

					Onychomycosis			
Oleaceae	*Fraxinus angustifolius* Vahl. BAHE106	Alssan Attir / Addardar	Leaves	Powder Decoction Infusion	Skin infections	1	0.01	[7]
	*Jasminum officinale*Linn. BAHE107	Al-yasmin	Leaves Whole plant	Oil	Wrinkles Acne Wound healing Fortify nails	2	0.02	[3]
	Olea europaea L. BAHE108	Zaytoune	Leaves Fruits	Decoction infusion maceration Oil Powder	Hair loss, and dandruff Nail care Eczema Chloasma Vitiligo	8	0.11	[3,10,13,22,25,32,37,53]
Papaveraceae	*Papaver rhoeas* L. BAHE109	Blaaman	Leaves Flowers Seeds	Decoction Infusion Powder	Colouring hair Hair care	2	0.02	[20,25]
Pedaliaceae	*Sesamum indicum* L. BAHE110	Janjlan	Seeds	Oil Powder	Moisturizes Wrinkles UV protection Hair loss, dandruff, and promotes hair growth	7	0.1	[13]
Pinaceae	*Pinus halepensis* Mill. BAHE111	Tayda	Barks Cone Resins	Decoction Powder	Wound healing Pruritus Eczema	1	0.01	[3,48]
Plantaginaceae	*Plantago major* L. BAHE112	El-masasa	Leaves Whole plant	Powder Cataplasm	Wound healing	2	0.02	[3,4,7,35,53]
Poaceae	*Arundo donax* L. BAHE113	Laqsab/ ghanim	Rhizome	Decoction Powder	Hair care, hair loss, and promotes hair growth	10	0.14	[7,8,42]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

	Avena sativa L. BAHE114	Khertale	Leaves Seeds	Decoction Powder	Lightening, and scrubber	5	0.07	[7]
	Oryza sativa L. BAHE115	Rouz	Seeds	Powder Mask	Brightening, and scrubber Chloasma	19	0.27	[7,54]
	Pennisetum glaucum (L.) R.Br BAHE116	Ilan	Seeds	Powder	Hair loss and promotes hair growth Anti-aging	1	0.01	-
Ranunculaceae	*Delphinium staphizagria* L. BAHE117	Habbat ras	Seeds	Powder	Hair loss and promotes hair growth	20	0.28	[7,35,42,44,47]
	Nigella sativa L. BAHE118	Sanouj/haba saoudae/habat lbaraka	Seeds	Oil	Hair care Hair loss Eczema	11	0.15	[7,12,41,57]
Rhamnaceae	*Ziziphus lotus* (L.) Lam. BAHE119	Asadra/ an'bag	Leaves	Decoction Powder	Hair care Hair loss	15	0.21	[7,8,43]
Rosaceae	*Crataegus monogyna* Jacq. BAHE120	Mzah/zaarour	Leaves Fruits	Maceration Juice	Skincare Wrinkles	2	0.02	[7,53]
	Malus communis(L.) Poir. BAHE121	Etefah	Fruits	Vinegar	Chloasma Skin mycosis Onychomycosis Eczema Vitiligo	15	0.21	[7,20]
	Prunus amylus var. amara BAHE122	Louz/ imrzig/ Louz morr	Fruits	Oil Powder	Wound healing Hair care	4	0.05	[33,35]
	Prunus dulcis Mill. BAHE123	Louz	Fruits	Oil Powder	Softening Wound healing Emollient Hair care Chloasma	9	0.12	[25,36,53,54]
	*Rosa damascena*Mill.	Lward	Flowers	Oil	Wound healing	42	0.6	[31,35,36,54]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

	BAHE124			Powder Hydrolat	Moisturizing Acne Antiperspirant Hair loss, and promotes hair growth Chloasma			
Rubiaceae	*Coffea arabica* L. BAHE125	Qahwa	Seeds	Oil Powder	Scrub Dark eye circles Skin moisturizer	4	0.05	[11,37]
	Rubia tinctorum L. BAHE126	Fowa/sarghina	Roots	Powder (with honey)	Hair loss, and hair colouring Skin toning and soothing	7	0.1	[7]
Rutaceae	*Citrus aurantium* L. BAHE127	Ranj	Fruits	Juice Raw	Skin lightening	1	0.01	[7,28]
	Citrus lemon L. BAHE128	Lhamd	Fruits	Juice Raw Oil	Acne Skin lightening Teeth whitening Antiperspirant	18	0.25	[7,28,34,53]
	Ruta montana L. BAHE129	Fijl	Whole plant	Oil	Eczema	2	0.02	[13,19,53]
Salvadoraceae	*Salvadora persica* Gardn. BAHE130	Oud arak	Stems	Raw	Tooth whitening and cleaning	6	0.08	[52,53]
Santalaceae	*Santalum album* L. BAHE131	A'sandal	Wood	Oil Powder	Eczema Psoriasis	1	0.01	-
Sapotaceae	*Argania spinosa* L. BAHE132	Argane	Leaves Fruits Seeds	Oil Powder	Acne Skin moisturizing, softening, and wound healing Hair care, and hair loss Chloasma	17	0.24	[7,12,19,23,34,36,43,52,54]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Solanaceae	*Hyoscyamus niger* L. BAHE133	Sikran/Gengit	Leaves Seeds	Powder	Eczema	5	0.07	[7,14,25,48]
Tamaricaceae	*Tamarix aphylla* (L.) Karst. BAHE134	Takawt	Leaves Seeds	Decoction Maceration Powder	Hair loss, and promotes hair growth Tooth whitening and cleaning	12	0.17	[4,7,32,34,42]
Theaceae	*Camellia sinensi* (L.) Kuntze. BAHE135	Hboub atay	Leaves	Decoction Infusion Powder Oil	Hair colouring and hair loss Periodontal disease Acne	10	0.14	[7,9,11,36,52]
Thymelaeaceae	*Daphne gnidium* L. BAHE136	Lezzâz	Leaves	Powder	Demelant Hair loss	27	0.38	[22,25,28,36,39]
Urticaceae	*Parietaria officinalis* L. BAHE137	Khawi l'aachoub/hchicha harcha	Leaves Stems flowers	-	Wound healing	1	0.01	-
	Urtica dioica L. BAHE138	L-harriga	Whole Plant	Decoction Infusion	Hair loss, dandruff, and promotes hair growth Eczema Psoriasis	2	0.02	[22,36,37,48]
Vitaceae	*Vitis vinifera* L. BAHE139	Dalya/ laà'nab	Seeds	Oil	Skin brightening Acne	2	0.02	[7,8]
Zingiberaceae	*Curcuma longa* L. BAHE140	Al kharkoum	Rhizome Stems	Powder Mask	Acne Wound healing Skin lightening	5	0.07	[7,12,36]
	Zingiber officinale roscoe. BAHE141	Skinjbir	Roots	Decoction Infusion Powder	Hair loss, and promotes hair growth	1	0.01	[7]
Zygophyllaceae	*Terminalia chebula* Retz.	Hlilaje	Fruits	Powder	Hair colouring	1	0.01	-

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

	BAHE142		Barks					
	Peganum harmala L.	Lharmal	Seeds	Decoction	Hair loss, dandruff, and	18	0.25	[4,43]
	BAHE143			Infusion	promotes hair growth			
				Powder	Eczema			

Table 3: Informant consensus factor (ICF)

Diseases	List of plant species used and number of uses	Nt	Nur	ICF
Hair care	*Ajuga iva* L. (1), *Allium cepa* L. (11) , *Allium sativum* L. (8), *Aloe vera* L. (6), *Argania spinosa* L. (4), *Arundo donax* L. (10), *Camellia sinensi* (L.) Kuntze (6), *Cannabis sativa* L. (10), *Capparis spinosa* L. (1), *Cassia senna* L. (1), *Chamaeleon gummifer* L. (1), *Citrullus lanatus* (Thunb.) Matsum. & Nakai (1), *Cocos nucifera* L. (1) ,*Coriandrum sativum* L. (1), *Cucumis sativus* L. (1), *Cucurbita maxima* Duchesne. (2), *Cyperus rotundus* L. (12), *Daphne gnidium* L. (27), *Delphinium staphizagria* L. (20), *Eruca sativa* Mill. (1), *Faidherbia albida* (Delile) A.Chev (2), *Foeniculum vulgare* Mill. (2), *Hibiscus sabdariffa* L. (21), *Homalothecium aureum* Lagasca, B.E (14), *Juglans regia* L. (15), *Juniperus oxycedrus* L. (1), *Lavandula officinalis* L. (34), *Lawsonia inermis* L.(25), *Lepidium sativum* L. (2), *Linum usitatissimum* L. (4), *Magydaris panacifolia* (Vahl) Lange (10), *Marrubium vulgare* L. (1), *Matricaria chamomilla* L. (30), *Melilotus indicus* (L.)All. (10), *Myrtus communis* L. (35), *Nigella sativa* L. (7), *Ocimum basilicum* L. (1), *Olea europaea* L.(1), *Opuntia maxima* Miller. (2), *Origanum compactum* Benth. (15), *Origanum majorana* L. (1) ,*Papaver rhoeas* L. (2), *Peganum harmala* L. (18), *Pennisetum glaucum* (L.) (1), *Petroselinum sativum*Hoffm(1), *Prunus amylus* var. amara (2), *Prunus dulcis* Mill. (4), *Punica granatum* L. (15), *Quercus faginea* Lam. (10), *Querqus suber* L (15), *Rosa damascena* Mill. (22), *Rosmarinus officinalis* L. (24), *Rubia tinctorum* L. (5), *Salvia officinalis* L. (16), *Sesamum indicum* L. (2), *Syzygium aromaticum* L (17), *Tamarix aphylla* (L.) Karst (9), *Terminalia chebula* Retz. (1), *Tetraclinis articulata* (Vahl) Mast (9), *Thymus zygis* L. (3), *Trigonella foenum-graecum* L. (13), *Urtica dioica* L. (1), *Vitex agnus-castus* L. (8), *Zingiber officinale* roscoe(1), *Ziziphus lotus* (L.) Lam. (15).	65	572	0.88
Face care	*Acacia raddiana* Savi. (3), *Aloe vera* L. (5), *Argania spinosa* L. (15), *Artemisia herba-halba* Asso. (2), *Avena sativa* L. (5), *Boswellia carterii* Bridw. (4), *Calendula officinalis* L (1), *Camellia sinensi* L. Kuntze (3), *Cannabis sativa* L. (1), *Capparis spinosa* L. (1), *Chamaeleon gummifer* L. (1), *Cicer arietinum* L. (15), *Cinnamomum cassia* L. Presl (2), *Citrus aurantium* L. (1), *Citrus lemon* L.(12), *Cocos nucifera* L.(2), *Coffea arabica* L. (4), *Crataegus monogyna* Jacq. (2), *Crocus sativus* L. (2), *Cucumis sativus* L. (4), *Curcuma longa* L. (5), *Daucus carota* L. (2), *Eruca sativa* Mill.(1), *Erythraea centaurium* L.(1), *Eucalyptus globulus* Labill (1), *Fraxinus angustifolius* Vahl. (1), *Glycine max* (L.) (3), *Glycyrrhiza glabra* L. (2), *Helianthus annuus* L. (1), *Jasminum officinale* Linn.(2), *Laurus nobilis* L. (1), *Lavandula officinalis* L. (7), *Linum usitatissimum* L. (2), *Lupinus albus* L. (6), *Matricaria chamomilla* L. (10), *Myrtus communis* L. (1), *Ocimum basilicum* L. (1), *Opuntia maxima* Miller. (7), *Oryza sativa* L. (17), *Parietaria officinalis* L. (1), *Pennisetum glaucum* L.(1), *Persea americana* Mill. (3), *Petroselinum sativum* Hoffm (1), *Pinus halepensis* Mill. (1), *Pistacia atlantica* Desf. (2), *Plantago major* L.(2), *Prunus amylus* var. amara (2), *Prunus dulcis* Mill. (4), *Querqus suber* L. (1), *Rosa damascena* Mill. (27), *Rosmarinus officinalis* L. (3), *Rubia tinctorum* L. (2), *Salvia verbenaca* L.(7), *Sesamum indicum* L.(5), *Tetraclinis articulata* (Vahl) Mast (1),	60	242	0.75

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

	Trigonella foenum-graecum L. (13), *Triticum sativum* L. (1), *Vicia faba* L. (10), *Vitis vinifera* L. (2), *Vitex agnus-castus* L.(4)			
Dermatosis	*Allium sativum* L. (2), *Ammi majus* L. (1), *Argania spinosa*L(2), *Boswellia carterii* Bridw. (1), *Cassia senna* L. (1), *Chamaeleon gummifer* L (1), *Cicer arietinum* L. (2), *Coriandrum sativum* L. (1), *Euphorbia officinarum subsp. echinus* (Hook.f. & Coss.) Vindt (1), *Hyoscyamus niger* L. (5), *Juniperus oxycedrus* L. (4), *Lavandula officinalis* L.(2), *Lawsonia inermis* L.(1), *Malus communis* L. Poir. (15), *Marrubium vulgare* L. (1), *Myrtus communis* L. (1), *Nigella sativa* L. (4), *Olea europaea* L. (6), *Origanum compactum* Benth. (3), *Oryza sativa* L (2), *Peganum harmala* L (1), *Pinus halepensis* Mill. (1), *Prunus dulcis* Mill. (1), *Rosa damascena* Mill.(3), *Ruta montana* (L.) (2), *Santalum album* L. (1), *Syzygium aromaticum* L (1), *Urtica dioica* L. (1), *Vitex agnus-castus* L.(1) .	29	68	0.58
Oral care	*Acacia nilotica* (L.) Willd. ex Delile (6), *Ajuga iva* L. (1), *Ammi visnaga* L. Lam. (7), *Artemisia herba-halba* Asso. (2), *Camellia sinensi* (L.) Kuntze (1), *Citrus lemon* L. (1), *Inula viscosa* L. (4), *Glycyrrhiza glabra* L. (1), *Juglans regia* L. (4), *Myrtus communis* L. (5), *Origanum compactum* Benth (11), *Pistacia atlantica* Desf. (2), *Punica granatum* L. (4), *Quercus faginea* Lam.(1), *Querqus suber* L. (2), *Salvadora persica* Gardn (6), *Syzygium aromaticum* L. (9), *Tamarix aphylla* (L.) Karst (3).	18	68	0.74
Nail care	*Allium sativum* L. (2), *Cucumis sativus* L. (1), *Jasminum officinale* Linn (1), *Olea europaea* L. (1), *Opuntia maxima* Miller.(1), *Persea americana* Mill. (1), *Vitex agnus-castus* L.(1).	7	8	0.14
Underarm care	*Citrus lemon* L. (1), *Lavandula officinalis* L. (2) ;*Origanum compactum* Benth. (1) ;*Rosa damascena* Mill. (2).	4	6	0.4

Table 4: Frequency of citation and fidelity level values of most used plant species for cosmetic purposes

Cosmetic use	Plant species	Frequency of citation (FC) %	Fidelity level (FL) %
Hair care	*Myrtus communis* L.	6.1	94.59
	Lavandula officinalis L.	5.93	80.95
	Matricaria chamomilla L.	5.23	93.75
	Daphne gnidium L.	4.71	100
	Lawsonia inermis L.	4.36	100
	Rosmarinus officinalis L.	4.18	85.71
	Rosa damascena Mill.	3.83	52.38
	Hibiscus sabdariffa L.	3.66	100
	Delphinium staphizagria L.	3.49	100
Face care	*Rosa damascena* Mill.	11.11	64.28
	Oryza sativa L.	6.99	89.47
	Argania spinosa L.	6.17	88.23
	Cicer arietinum L.	6.17	88.23
	Trigonella foenum-graecum L.	5.34	76.47
	Citrus lemon L.	4.93	66.66
	Matricaria chamomilla L.	4.11	31.25
	Vicia faba L.	4.11	100
	Salvia verbenaca L.	2.88	100
	Lavandula officinalis L.	2.88	16.66
	Opuntia maxima Miller.	2.88	100
Dermatosis	*Malus communis* L.	22.05	100
	Olea europaea L.	8.82	75.00
	Hyoscyamus niger L.	7.35	100
	Juniperus oxycedrus L.	5.88	100
Oral care	*Origanum compactum* Benth.	14.10	40.74
	Syzygium aromaticum L.	11.53	33.33
	Punica granatum L.	10.25	34.78
	Ammi visnaga L.	8.97	100
	Acacia nilotica L.	7.69	100

This high level of use is explained by the fact that it is used in many recipes as an excipient; which is an active principle vehicle for several preparations comprising many components. Hydrolat from this species is the main excipient used to prepare cosmetic recipes, but can also be used for its own cosmetic properties as spray for daily use, or as oil. This effect has also been reported by other studies.[7,12,13] Pharmacologically, it has been shown to protect against UVB-induced skin aging.[49]

The second most frequently used plant is *Oryza sativa* L. with a FL of 89.47 %. It has been used to lighten the skin and as an exfoliant. The face mask made from dried seed powder mixed with flour and water is used as an anti-spot wash.[37]*Argania spinosa* L. (88.23%) has moisturizing, softening, and healing properties for the skin. it is also used for acne and chloasma. several studies have recorded these effects, in addition to the treatment of vitiligo.[23,43] Argan oil is used externally for skin diseases, acne, desquamation, and dry wrinkled, or scaly skin. [50]*Salvia verbenaca* L. (100%) was among the plants cited for wound healing, applied in poultice or powder form. Its effects have been described in several ethnobotanical studies.[4,20,37]

Informant consensus factor (ICF)

Cosmetic uses of medicinal plants reported in the present survey were divided into five categories as mentioned in Table 3 with their Informant consensus factor (ICF). The Informant Consensus Factor (ICF) for different condition categories was calculated to test the consistency of the informants' knowledge. It is used to highlight cultural relevance and agreement regarding plant use. In the present study, the ICF values ranged from 0.14 to 0.88, the high value of ICF was recorded for the hair care category (ICF=0.88), followed by face care (ICF=0.75), which indicates that informants agree on the use of taxa within these two categories. In addition to this, people, especially women, use plants extensively for their hair and face care.

Conclusion

This study has described the medicinal plants with potential cosmetic use in the region of Fez-Meknes. A total of 108 plant species were inventoried, belonging to 50 botanical families, of which the Lamiaceae and Fabaceae families are the most representative. *Lavandula officinalis* L., *Rosa damascena*Mill.,*Myrtus communis* L., and *Matricaria chamomilla L.*, are the most used medicinal plant species with high Use values. Leaves and seeds have been identified as the most plant parts used. Mainly, they are prepared and applied as powder, decoction, or infusion.

Ethnobotanical studies contribute to the preservation of traditional knowledge. However, for the better valorization of cosmetic plants, cooperation between researchers, botanists, chemists, toxicologists, and biologists is recommended to analyze the interesting properties, safety, efficacy, and efficiency of documented medicinal plants with cosmetic value.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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