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Herbalists and wild medicinal plants in M'Sila (North Algeria): An ethnopharmacology survey

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ABSTRACT

Ethnopharmacological relevance: The main aim of this study was to identify, catalogue and document the large number of wild medicinal plants used in the M'Sila region (northern Algeria) for the treatment of several human pathologies. Another more ambitious aim is to contribute to overcoming the limits of an orally transmitted pharmacopoeia, attempting to exploit the large ethnopharmacology patrimony of the region for further pharmacological purposes.

Materials and methods: Our field study was carried out over a period of three years (2008–2010). During this period, herbalists were interviewed using semi-structured questionnaires investigating the herbalist as a holder of information (gender, age and educational level) and about wild medicinal plants (local name, uses and part used). In addition, the relative importance value of the species was determined and informant consensus factor (ICF) was calculated for the medicinal plants included in the study.

Results: A total of 83 herbalists were interviewed; men dominate the practice of traditional medicine in the region. About 41% of them are between 31 and 40 years, and about a third (34%) are illiterate. The traditional herbal knowledge is passed from generation to generation in the verbal form, a writing tradition being almost totally absent. The interviewed herbalists identified and recorded 58 plants species and 50 genera belonging to 27 plant families. Lamiaceae and Asteraceae were the most represented plant families. The aerial parts were the most commonly used plant part, while infusion and decoction were the most common method of traditional drug preparation.

Conclusions: The survey provides a veritable source of information on the herbalists and wild medicinal plants. Plants which are used in different parts of the world for the treatment of similar diseases may be deemed to be effective in pharmacological terms. These medicinal plants may be incorporated into the healthcare delivery system of the country.

1. Introduction

Algerian pharmacopoeia is qualified as traditional because, unlike Western pharmacopoeias which have been formalized in forms or codex, it has not been written down but has continued to the present by passing from generation to generation among healers and herbalists through oral transmission of knowledge and practice of the medical art (Baba Aissa, 1991). Today, this knowledge, belonging to traditional healers is transmitted less and tends to disappear. A successful way to keep the culture, the knowledge and the plants associated with them relevant is to use the resulting knowledge and give it new life by integrating traditional medicine into the modern health system using ethnobotany and ethnopharmacology.

Ethnobotany is the study of how modern and indigenous societies view and use plants (Balick and Cox, 1996). The use of natural products with healing properties is as old as human civilization and for a long time, minerals, animal and plant products were the main sources of drugs (Rates, 2001). Several active compounds have been discovered from plants on the basis of ethnobotanical information, and used directly or as lead compounds for patented drugs. In the last 30 years about 50% of marketed drugs can be considered as being natural product-derived, and several literature reports have underlined the fundamental role of natural products in the process of new drug development (Kingston and Newman, 2005; Verpoorte et al. 2006; Baker et al. 2007; Butler, 2008; Cragg et al. 2009; Cordell,

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2011; Kingston, 2011; Cordell and Colvard, 2012; Newman and Cragg, 2012).

Documentation of the indigenous knowledge through ethnobotanical and ethnopharmacological studies is important for the conservation and use of biological resources, and at the same time represents an essential tool in defense of biodiversity (Heywood, 2011). Therefore, recording the local names and indigenous uses of plants has significant potential benefits for the society (Cakilcioglu and Turkoglu, 2010).

In Algeria, few ethnobotanical surveys have been carried out in the Central Sahara region, North-Eastern and North-Western (Lahsissene and Kahouadji, 2010; Meddour et al., 2011; Azzi et al., 2012; Bouzabata, 2013), whereas similar studies of the central area of Northern Algeria are almost totally absent. This is in contrast with the wide use of medicinal plants in M'Sila, a typical region of this part of Algeria. The socio-economic and cultural contexts strongly influence the people's choice in fighting several pathologies through the use of medicinal plants, as does the high cost of modern medicine.

2. Materials and methods

2.1. Survey area

M'Sila (known also as Hodna) region is situated in the central part of northern Algeria at 35° 42′ N latitude and 4° 32′ E longitude. It covers a total area of 18,718 km^2 (47 municipalities) (Fig. 1), with an estimated population of about 1,030,000. The territory is mostly hilly with an average altitude of 500 m, semi-arid and characterized by the predominance of steppe (63% total area). It has a continental climate with hot dry summers and very cold winters, with irregular rainfall of between 100 and 250 mm/year (Le Houerou, 1995; Moreau et al. 2005). The area is characterized by an ecological diversity represented by two principal ecosystems: steppe (represented by Chott el Hodna, wetland of international importance as defined by the Ramsar Convention, and reserve of El Mergueb) and forest (represented in the north by the forest of Maadid and Ouanougha and in the south by the forest of Djebel Messaad). The steppe, with over 1.2 million ha, covers the largest amount of the region (63% total area). The climate is continental, and influenced by the neighboring Saharan territory. Summer is hot and dry while winter is very cold, with low and irregular rainfall in the order of 100–250 mm/year (Seltzer, 1946; Le Houerou, 1995).

The economy of the region is based on sheep-breeding (sheep and goats), whereas the area used for agriculture accounts for 20% of the total territory, being mainly devoted to cereals, arboriculture and market gardening (FAO, 1966). Rustic arboriculture is marked by the predominance of the apricot followed by the olive tree cultivation (Feliachi, 2003; Behlouli et al., 2008).

2.2. Interviews

A questionnaire was given to the herbalists (Fig. 2), through face-to-face interviews (Mehdioui and Kahouadji, 2007). The information is divided into two parts; the first concerns the herbalists as the sole owner of the information while the second gathers information concerning the medicinal plants such as local names, plant part used, medicinal use, preparation and price. The ethnobotanical survey exercise was carried out over a period of three years (2008–2010). In the process, plant specimens involved were collected, and subsequently preserved and stored in the herbarium of the Department of Nature and Life Sciences, Faculty of Sciences, University of M'Sila. The identity of each plant species mentioned by the herbalists was verified and confirmed by botanists of the Department and by bibliography (Quezel and Santa, 1962–1963; Ozenda, 1977). A medicinal use was accepted as valid only if it was mentioned by at least three independent interviewees (Al-Qura'n, 2009).

2.3. Informants consensus factor (ICF) and use-value (UV) of plant species

For data analysis, informant consensus factor (ICF) was employed to indicate how far the information is homogeneous. All citations were placed into ailment categories for which the plant was claimed to be used. ICF values will be low (near 0) if plants are chosen randomly, or if informants do not exchange information about their use. Values will be high (near 1) if there is a well-defined selection criterion in the community and/or if information is exchanged between informants (Abu-Irmaileh and Afifi, 2003). The ICF (Trotter and Logan, 1986) is calculated as in the following formula:

$$ICF = Nur–Nt/Nur^{-1}$$

where Nur is the number of use citations in each category and Nt is the number of species used.

The use-value of species (UV) (Abu-Irmaileh and Afifi, 2003), a quantitative method that demonstrates the relative importance of

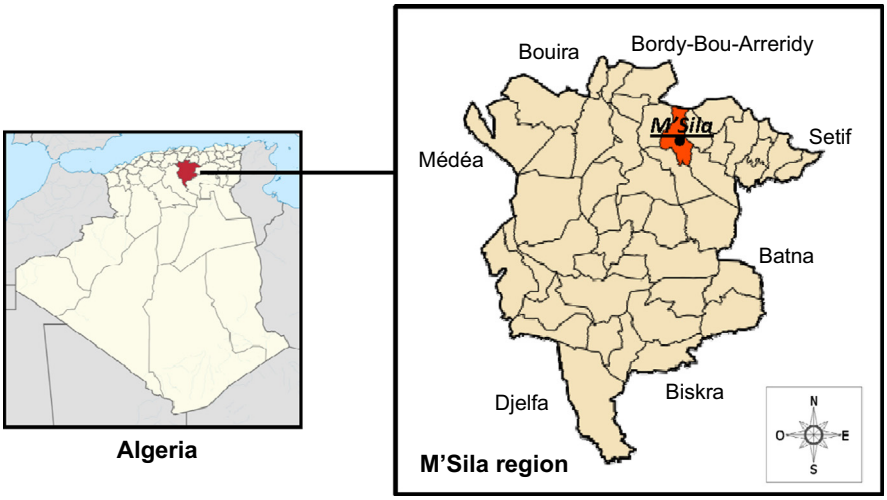

Fig. 1. Location of the study area.

QUESTIONNAIRE CARD N°…..

SECTION A

Date	Area	Gender		Age	Educational level			
		M	F		Illiterate	Primary	Secondary	Academic
…	…....	…	…	…..	…	…	…	…

SECTION B

	Botanical classification Plant name (family)	Common/trivial name
	………………..	………………………………………
Utilization (Type of disease) *NB : No recipes*	………………………………………………………………………………………	

Mode of use	Infusion	Decoction	Fumigation	Maceration	Powder	Cream	Bath	Tablet
	…..	…..	…..	…..	…..	…..	…..	…..
used part(s)	Root	Leaf	Fruit	Flower	Seed	Flowered tops	Aerial parts	Whole plant
	…..	…..	…..	….	…..	…..	…..	…..
why?	….. ..…	…. ….	….. …..	….. …..	….. …..	….. …..	….. …..	….. …..
price/ 100g	…..	…..	…..	…..	…..	…..	…..	…..

Fig. 2. Questionnaire card of survey.

species known locally, was also calculated according to the following formula:

$$UV = U/N$$

where U is the number of citations per species and N the number of informants. Data of UV and ICF are shown in Tables 1 and 2, respectively.

3. Results and discussion

In our study 83 herbalists were interviewed in total. Men dominate the practice of traditional medicine at 84% which is probably due to the cultural traditions of the region, where women are not encouraged to work outside the family. The age group of 31–40 is the most important among herbalists in the region (about 41%); they have acquired their knowledge from generation to generation. The age group over 60 years is a very low frequency group (about 06%). A third of herbalists are illiterate (34%) or with a primary or secondary education (11% and 31% respectively); even if herbalists with a university education exist (24%) this is still low compared to the level of the other herbalists in the Algerian countryside.

A total of 58 plant species and 50 genera distributed over 27 families with a dominance of especially Lamiaceae and Asteraceae (22.4% and 20.7%, respectively) were listed (Table 1).

The aerial part of the plant is most commonly used with a percentage of 69, then flowered tops and leaf with 8%; roots, flower, fruit and seeds are also used but in a low percentage (5, 4, 3 and 3 respectively). It is well known that not all the plant parts (organs) contain the same concentration of the active constituents. Not only that, but many different parts of plants contain totally different phytochemical substances (Bruneton, 1999). Herbalists in M'Sila are not fully aware of this and they always employ the aerial part based on traditional heritage rather than a scientific knowledge.

Decoction or infusion is the most common method of preparation of medicinal plants with a percentage of 36 and 35 respectively; other methods of preparation and use were recorded such as powder (13%) or compress (10%).

As calculated by the use-value UV, *Juniperus phoenicea* L. (0.51), *Rosmarinus officinalis* L. (0.51), *Marrubium vulgare* L. (0.48), *Salvia officinalis* L. (0.48), *Ruta chalepensis* L. (0.46) and *Artemisia herba alba* Asso (0.44) were reported to be of the highest use-value. The ICF values obtained for the categorized ailments are presented in Table 2. Ten ailment categories were reported, namely, digestive problems, diabetes, anti-inflammatory, blood pressure, leishmaniasis, tumors or cancer, the healing of wounds, hepatic disease, eczema and eye infections. ICF values obtained for the reported categories indicate the degree of shared knowledge for the treatment of the ailment by medicinal herbs. The highest ICF (0.79) was scored for leishmaniasis ailments which may indicate high incidence of this type of disease in the region; *Ajuga iva, Globularia alypum, Marrubium deserti, Marrubium vulgare, Neurium oleander* and *Thymelaea hirsuta* were reported within the plant remedies indicated for this use. Hepatic disease recorded the second highest ICF value (0.78). Tumors or cancers were recorded as the third group (0.72), while the fourth level of ICF values (0.71) was recorded for digestive problems category, which include the relief of ailments such as flatulence, spasm and peptic ulcer. Anti-inflammatory was ranked as the fifth ailment with ICF value of 0.69. ICF values of 0.63 and 0.62 were recorded for diabetes and blood pressure respectively. The last citations of this ranking were reported for plants used to treat wounds healing, eczema and eye infections with ICF values of 0.58, 0.51 and 0.50 respectively (Table 2). A search through the literature for other field surveys carried out in Algeria and over the North African areas lying within the neighboring region of similar biogeographical zone and biodiversity revealed a great degree of agreement concerning medicinal plants and their traditional remedial uses (Lahsissene and Kahouadji, 2010; Meddour et al., 2011). In the comparison, plants which were shown to have the same use include *Ajuga iva, Anthemis nobilis, Artemisia absinthium, Artemisia herba alba,*

Table 1
List of wild medicinal plants used in the treatment of human ailments in M'Sila region.

Family plant species—(Voucher specimen no.)	Local name	Part used	Method of use	Recommended uses	UV value	Recorded literature uses
Apiaceae						
Anethum graveolens L. (AB–9)	Chebth	Aerial parts	Infusion	Diuretic, hepatic diseases	0.04	Anticancer[a]
Ferula communis L. (AB–37)	Kelekha	Aerial parts	Decoction	Weight loss	0.02	Antispasmodic[b]
Pituranthos scoparius Benth. et Hook (AB–71)	Kozah	Aerial parts	Decoction	Digestive disorders	0.02	Asthma[c]
Thapsia garganica L. (AB–93)	Bounafaàe	Aerial parts, roots	Tablet	Anti-inflammatory, eczema	0.13	Skin irritant[d]
Apocynaceae						
Neurium oleander L. (AB–55)	Defla	Flowers	Infusion, powder	Antitumor, leishmanicidal, eczema	0.04	Antitussive[e]
Aristolochiaceae						
Aristolochia rotunda L. (AB–12)	Ben rostom	Roots	Powder	Antitumor	0.10	Wound-healing[f]
Asteraceae						
Achillea millefolium L. (AB–3)	Ekhelia	Flowered tops	Infusion	Tonic	0.04	Digestive[g]
Anthemis nobilis L. (AB–10)	Babounje	Flowered tops	Infusion, tablet	Anti-inflammatory, Sedative, eczema	0.40	Anti-inflammatory[h]
Artemisia absinthum L. (AB–13)	Chajrat meriem	Aerial parts	Infusion	Antidiabetic, Antihypertensive, Analgesic	0.21	Digestive[i]
Artemisia campestris L. (AB–14)	Tegofte	Aerial parts	Decoction	Antidiabetic, antihypertensive	0.23	Antidiabetic[j]
Artemisia herba alba Asso. (AB–15)	Chih	Aerial parts	Infusion, decoction	Antidiabetic, antispasmodic, carminative, eczema	0.44	Antileishmanial[k]
Atractylis gummifera L. (AB–16)	Ladad	Roots	Infusion	Antispasmodic	0.02	No report
Chrysanthemum parthenium (L.) Bernh. (AB–24)	Rkiza	Flowers	Infusion	Digestive disorders	0.01	Antileishmanial[l]
Pallenis spinosa (L.) Cass. (AB–62)	Negoud	Aerial parts	Infusion, decoction	Antidiabetic	0.08	Anti-inflammatory[m]
Santolina rosmarinifolia L. (AB–85)	Jaàda	Aerial parts	Infusion, decoction, powder	Wound healing, digestive disorders	0.14	Digestive[n]
Taraxacum laevigatum (Willd.) DC. (AB–90)	Telma	Aerial parts	Infusion, fresh	Sudorific, diuretic	0.03	Anti-allergic[o]
Taraxacum officinale Weber (AB–91)	Hendeba	Aerial parts	Infusion, decoction	Antidiabetic, tonic	0.25	Anti-inflammatory[p]
Caryophyllaceae						
Paronychia argentea (Pourr.) Lamk (AB–64)	Fatet lehdjar	Aerial parts	Infusion, decoction	Antilithiasis	0.12	Digestive[q]
Borraginaceae						
Anchusa azurea Mill. (AB–8)	Lessan elthor	Aerial parts	Infusion	Antitumor, anti-inflammatory	0.01	Wound-healing[g]
Chenopodiaceae						
Atriplex halimus L. (AB–17)	Gtaf	Aerial parts	Infusion, lotion	Eczema	0.06	Antidiabetic[r]
Spinacia oleracea L. (AB–86)	Selg	Leaves	Infusion, tablet	Antidiabetic, anti-inflammatory	0.02	Hepatic diseases[s]
Cucurbitaceae						
Citrullus colocynthis L. (AB–26)	Haj, Handhal	Aerial parts, fruit	Decoction, pomade	Antihypertensive, antitumor	0.27	Anti-diabetic[t]
Ecballium elaterium Rich. (AB–33)	Fegous lehmir	Fruit	Insufflation	Hepatic diseases	0.05	For fluid retention[e]
Cupressaceae						
Juniperus oxycedrus L. (AB–42)	Taga	Aerial parts	Tablet	Anti-inflammatory, eye infections	0.32	Kidney stones[g]
Juniperus phoenicea L. (AB–43)	Aaràar	Aerial parts	Infusion, decoction, tablet	Digestive disorders, antihypertensive, anti-inflammatory, eczema	0.51	Skin diseases[e] (eczema)
Equisetaceae						
Equisetum arvense L. (AB–34)	Dhaneb elkheil	Aerial parts	Decoction	Antitumor, hepatic diseases	0.04	Antidiabetic[u]
Fabaceae						
Retama retam Webb. (AB–76)	Retam	Aerial parts	Decoction	Vermifuge, eczema	0.10	Antidiabetic[v]
Gentinaceae						
Erythraea centaurium (L.) Pers. (AB–35)	Morart lehnach	Flowered tops	Decoction	Antipyretic, digestive disorders	0.15	Anti-inflammatory[w]
Globulariaceae						
Globularia alypum L. (AB–40)	Tesslegha	Flowered tops	Infusion, decoction	Antidiabetic, eishmanicidal, digestive disorders, eczema	0.29	Antidiabetic[x]
Lamiaceae						
Ajuga iva Schreb. (AB–4)	Chendgoura	Aerial parts	Infusion, decoction, powder	Antidiabetic, antihypertensive, leishmanicidal, digestive disorders, eczema	0.42	Antidiabetic[y]
Ballota hirsuta Benth. (AB – 18)	Meriout	Aerial parts	Decoction	Digestive disorders	0.25	No report
Marrubium deserti de Noé (AB–47)	Merriouet sahraui	Leaves	Infusion, maceration, powder	Leishmanicidal, antidiabetic, digestive disorders	0.40	Digestive[z]
Marrubium supinum L. (AB–48)	Merriouet	Aerial parts	Infusion	Antihypertensive	0.31	No report
Marrubium vulgare L. (AB–49)	Merriouet	Aerial parts	Infusion, powder	Antidiabetic, leishmanicidal, digestive disorders	0.48	Antidiabetic[y]
Mentha pulegium L. (AB–50)	Feliou	Aerial parts	Infusion	Antihypertensive, antispasmodic	0.19	Antidiabetic[y]
Mentha rotundifolia L. (AB–51)	Meguene	Aerial parts	Infusion, tablet	Anti-inflammatory	0.21	Antihypertensive[aa]
Origanum glandulosum Desf. (AB–61)	Zaàter	Aerial parts	Decoction	Antihypertensive, digestive disorders	0.19	Antidiabetic[ab]
Rosmarinus officinalis L. (AB–80)	Iklil eljabel	Aerial parts	Infusion, decoction	Antihypertnsive, hepatic diseases, antitumoral, eczema	0.51	Antispasmodic[e]
Salvia officinalis L. (AB–83)	Siwak elnabi	Aerial parts	Infusion, powder	Antidiabetic, antihypertensive, weight loss, eczema	0.48	Antidiabetic[ac]
Salvia verbenacea Batt. (AB–84)	Om lemdhamedh	Aerial parts	Decoction, powder	Wound healing, carminative, tonic	0.04	Antipyretic[ad]
Teucrium polium L. (AB–92)	Khayata	Aerial parts	Decoction, powder	Antidiabetic, antihypertensive, wound healing	0.40	Astringent[e]

Table 1 (*continued*)

Family plant species—(Voucher specimen no.)	Local name	Part used	Method of use	Recommended uses	UV value	Recorded literature uses
Thymus ciliatus (Desf.) (AB–95)	Djertil	Aerial parts	Decoction	Antidiabetic, antihypertensive, hypocholesterolemic	0.29	Vermifuge[ae]
Malvaceae						
Malva sylvestris L. (AB–46)	Khobeiz	Aerial parts	Decoction	Anti-inflammatory, weight loss	0.08	Emollient[e]
Myrtaceae						
Eucalyptus globulus Labill. (AB–36)	Kalitousse	Leaves	Infusion, decoction	Colds and flu, antitussive	0.25	Antileshmanial[e]
Myrtus communis L. (AB–54)	Rihane	Aerial parts	Infusion, decoction	Antihypertensive	0.19	Antidiabetic[y]
Oleaceae						
Olea europea L. (AB–58)	Zitoune	Leaves	Decoction	Antidiabetic, antihypertensive, eczema	0.34	Anthypertensive[af]
Plantaginaceae						
Plantago lanceolata L. (AB–72)	Lessan elhamel	Aerial parts	Infusion, tablet	Wound healing, eye infections	0.02	Antiinflammatory[ag]
Poaceae						
Ampelodesma mauritanicum (Poiret) Dur. and Sch. (AB–7)	Diss	Aerial parts	Decoction	Antidiabetic, antihypertensive	0.02	Antidiabetic[ah]
Stipa tenacissima L. (AB–87)	Helfa	Aerial parts	Decoction, powder	Antidiabetic, weight loss	0.19	No report
Rhamnaceae						
Rhamnus alaternus L. (AB–77)	Melilesse	Aerial parts	Decoction	Hepatic diseases	0.27	Depurative[ai]
Zizyphus lotus L. (AB–100)	Sedra	Leaves	Infusion, decoction, powder	Anti-inflammatory, wound healing, eczema	0.38	Antidiabetic[y]
Rutaceae						
Ruta chalepensis L. (AB–82)	Fijel	Aerial parts	Infusion, powder	Antihypertensive, antispasmodic, eczema	0.46	Antispasmodic[af]
Tamaricaceae						
Tamarix africana Poir. (AB–89)	Tarfa	Aerial parts	Decoction	Digestive disorders	0.02	Eye diseases[aj]
Thymelaeaceae						
Daphne gnidium L. (AB–32)	Lazaz	Aerial parts	Tablet	Anti-inflammatory	0.12	Anti-inflammatory[ak]
Thymelaea hirsuta Endl. (AB–94)	Methnane	Aerial parts	Infusion, tablet	Leishmanicidal, vermifuge, eczema	0.12	Antidiabetic[al]
Typhaceae						
Thypha angustifolia L. (AB–96)	Bardi	Seeds	Decoction	Wound healing	0.08	No report
Urticaceae						
Urtica dioica L. (AB–98)	Horeig	Flowered tops	Decoction, tablet	Antidiabetic, anti-inflammatory	0.36	Antirheumatic[g]
Zygophyllaceae						
Peganum harmala L. (AB–65)	Harmel	Aerial parts, seeds	Infusion, decoction, powder	Antidiabetic, antihypertensive	0.34	Skin diseases[af]

[a] (Heamalatha et al., 2011).
[b] (Sahebkar and Iranshahi, 2010).
[c] (Benmekhbi et al., 2008).
[d] (Christensen et al., 1982).
[e] (Asgarpanah and Roohi, 2012).
[f] (Chevallie, 1996).
[g] (Cakilcioglu and Turkoglu, 2010).
[h] (Rossi et al., 1988).
[i] (Mahmoudi et al., 2009).
[j] (Akrout et al., 2012).
[k] (Aharonson et al., 1969).
[l] (Rajamanickam et al., 2010).
[m] (Djebara et al., 2012).
[n] (Barrero et al., 1999).
[o] (Zielińska and Kisiel, 2000).
[p] (Zhang et al., 2008).
[q] (Novais et al., 2004).
[r] (Tiuman and Nakamura, 2005).
[s] (Vasthi, 2011).
[t] (Ladhari et al., 2011).
[u] (Berkan et al., 1991).
[v] (Algandaby et al., 2010).
[w] (Ei Tahir et al., 1998).
[x] (Skim et al., 1999).
[y] (Allali et al., 2008).
[z] (Zaabat et al., 2010).
[aa] (Brada et al., 2007).
[ab] (Sari et al., 2006).
[ac] (Eidi and Eidi, 2009).
[ad] (Kamatou et al., 2008).
[ae] (Abdellah et al., 2012).
[af] (Aburjai et al., 2007).
[ag] (Beara et al., 2012).
[ah] (Djilani et al., 2011).
[ai] (Ben Ammar et al., 2007).
[aj] (Saïdana et al., 2008).
[ak] (Al-Qura'n, 2009).
[al] (Bnouham et al., 2007).

Table 2
Informant consensus factor (ICF) values of category of ailments.

Ailments	Species	% All species	Use citations	% All use citations	IFC
Eye infections	2	3.44	3	1.09	0.50
Eczema	15	25.86	30	10.90	0.51
Wounds healing	6	10.34	13	4.72	0.58
Blood pressure	17	29.31	44	16	0.62
Diabetes	18	31.03	48	17.45	0.63
Rheumatism	11	18.96	34	12.36	0.69
Gastric disorders	12	20.69	39	14.81	0.71
Tumors or cancer	6	10.34	19	6.90	0.72
Hepatic diseases	5	8.62	20	7.27	0.78
Leishmaniasis	6	10.34	25	9.09	0.79

Eucalyptus globulus, Globularia alypum, Juniperus phoenicea, Marrubium deserti, Marrubium vulgare Neurium oleander, Olea europea, Origanum glandulosum, Rosmarinus officinalis, Salvia officinalis and *Santolina rosmarinifolia*. Most of the aforesaid plants are used for the same purposes in other regions of Algeria, as well as in neighboring countries such as Morocco and Tunisia.

Finally, we would like to underline that recent studies partially confirm the accuracy of some ethnopharmacology data reported here. In fact, in Table 1 for almost all plant species, a consistent pool of bibliographic reports, through phytochemical and, mainly, pharmacological assays, confirm most of the bio-activities claimed by the ethnopharmacology evaluations. In particular, in an animal model, oral administration of 200 and 300 mg/kg body weight of the aqueous extract from *Marrubium vulgare* (Table 1) induced a significant antidiabetic and anti-hyperlipidemic effect (Boudjelal et al., 2012); as well as the determination of the antioxidant effectiveness of *Ajuga iva* aqueous extract and other biological activities of some Algerian medicinal plants extracts (Djeridane et al., 2006); or the antibacterial, antioxidant and antigenotoxic properties of the methanolic extracts of *Teucrium polium, Ajuga iva* and *Marrubium deserti* (Zaabat et al., 2010; Zerroug et al., 2011).

4. Conclusions

This is the first study which quantifies the use of medicinal plants by the traditional M'Sila herbalists in this area. The survey shows that there is a high diversity of medicinal plants used in M'Sila for treating common ailments and some very important diseases. The preservation of this traditional knowledge is an essential requirement for maintaining continuity and transmission of traditional medicine, and as previously mentioned for recording traditional cultural heritage also based on local biodiversity which risks being lost. With this in mind, the younger generation should also be encouraged to learn about traditional medicinal knowledge with the aim of preserving it.

Some negative aspects of the ethnopharmacology lie in its dependence on unqualified practitioners as providers of healthcare to populations living in poverty and with low levels of education, and the abuse of this ignorance by mystic, spiritual and pseudo-religious practices, particularly in the areas in which the medical service is not present (Sheehan, 2009). However, it should be underlined that despite these drawbacks, it is realistic to affirm that large portions of the world population consult traditional medical practitioners for healthcare. According to estimates by the World Health Organization, more than 3.5 billion people in the developing world rely on plants as components for their primary healthcare, with as many as 80% of the population in Africa (González-Tejero et al., 2008; African Conservation Foundation, 2010), and although modern medicines may be available in some developing countries, herbal remedies enjoy great popularity for historical and cultural reasons (Aburjai et al., 2007; Yan et al., 2008; Mukherjee et al., 2010). Concurrently, in many developed countries an increasing portion of people have begun to turn to alternative-medicines or complementary therapies, which include the use of medicinal herbs (Craker, 2007; Espin et al., 2007; Nobili et al., 2009; Napoli and Ruberto, 2012).

For these reasons therefore, the documentation, registration and analysis of traditional medicinal practices are essential; large sectors of the population in a large number of countries use these medicines, and scientific support on the safety, efficacy and composition of these treatments must be considered necessary. Moreover, an ethnobotanical and ethnopharmacological survey such as the one reported here, when supported by phytochemical studies, could open the way to the addition of new biomolecular scaffolds to the pharmacological field. Above all, however, its aim is to give further tools for developing strategies to improve the health of the indigenous people incorporating local medicinal plants into the healthcare delivery system of the country.

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