Botanical and medicinal profile of aromatic and medicinal plants: Case of the Gharb region, Morocco

[Perfil botánico y medicinal de plantas aromáticas y medicinales: caso de la región de Gharb, Marruecos]

Lahcen Bouayyadi*, Lahcen Zidane

Department of Biology, Faculty of Sciences, Ibn Tofail University, B.P. 133 14000, Kenitra, Morocco.
*E-mail: bouayyadi.lahcen@uit.ac.ma, bouayyadilahcen76@gmail.com

Abstract

Context: Medicinal plants remain a source of medical care in developing countries in the absence of an effective medical system.

Aims: To establish the list and ethnobotanical characteristics of the most used plants in the Gharb region.

Methods: A survey was conducted on more than 704 subjects from the region of which 52.5% were women. The average age of these informants was 41.57 ± 0.51 years and 82.95% were married.

Results: The results of this study made it possible to draw up a catalog composed of 187 plant species, divided into 156 genera and grouped into 71 families. Otherwise, 47.44% of respondents confirmed having confidence in traditional medicine. The calculation of the use value showed that the latter varies between 1 and 9 possible uses. However, the Relative Frequency of Citation showed that some species display significant values reaching 9.49% for the species *Eucalyptus globules* Labill. In addition, the consensual factor of the survey showed a strong association between the most used species like *Eucalyptus globules* Labill.; *Origanum compactum* Benth.; *Mentha pulegium* L; *Lavandula dentata* L; *Chenopodium ambrosioide* L.; *Marrubium vulgare* L., *Allium sativum* L. and diseases treated by these plants, namely digestive and respiratory diseases.

Conclusions: Phytotherapy is undoubtedly the main adopted medicine by the local population of the Gharb region, especially for the treatment of digestive diseases. *Myrtaceae*, *Lamiaceae* and *Zingiberaceae*, represent the most family's plants mentioned by the respondents.

Keywords: ethnobotany; Gharb of Morocco; phytotherapy; survey; traditional medicine.

Resumen

Contexto: En ausencia de un sistema médico eficaz, las plantas medicinales siguen siendo una fuente de atención médica en los países en desarrollo.

Objetivos: Establecer la lista y las características etnobotánicas de las plantas más utilizadas en la región del Gharb (Marruecos).

Métodos: Se realizó una encuesta a más de 704 sujetos de esta región, 52,5% de sexo femenino. Su edad promedio fue de 41,57 ± 0,51 años, 82,95% estaban casados.

Resultados: Los resultados permitieron elaborar un catálogo compuesto por 187 especies de plantas, repartidas en 156 géneros y agrupadas en 71 familias. Además, 47,44% de los encuestados confirmaron confiar en la medicina tradicional. El cálculo del valor de uso fluctuó entre 1 y 9 posibles usos que correspondieron a una tasa que osciló entre 0,13% y 1,2%. Sin embargo, el índice de Importancia Cultural mostró que algunas especies presentaronn valores significativos que alcanzaron 3,72% para la especie *Eucalyptus globulus* Labill. Además, el factor consensual de la encuesta reveló una fuerte relación entre las especies más utilizadas como *Eucalyptus globulus* Labill.; *Origanum compactum* Benth.; *Mentha pulegium* L.; *Lavandula dentata* L.; *Chenopodium ambrosioides* L.; *Marrubium vulgare* L. y *Allium sativum* L. y las enfermedades tratadas con estas plantas, particularmente, las digestivas y respiratorias.

Conclusiones: La fitoterapia es sin duda la principal medicina adoptada por la población local de la región de Gharb, especialmente para el tratamiento de enfermedades digestivas. Myrtaceae, Lamiaceae y Zingiberaceae, representan la mayoría de las plantas familiares mencionadas por los encuestados.

Palabras Clave: etnobotánica; fitoterapia; Gharb de Marruecos; medicina tradicional.

INTRODUCTION

Since its appearance, the concern of man has been the satisfaction of his food needs. He started to explode the environment around him. As a result, he appreciates the soothing and analgesic virtues of plants. In fact, he had resorted to the plants that surrounded him to heal himself. This practice known as the traditional pharmacopoeia holds its place in most societies including Moroccan society, however it has some disadvantages such as, imprecise diagnosis, dosage not respected (Muthu et al., 2006). In fact, of the 300,000 plant species recorded on the planet, more than 200,000 species live in the tropical countries of Africa (Sofowora, 1993; Diallo, 2000). The Mediterranean Basin alone is home to about 10% (25,000) of the world's known vascular plants (Radford et al., 2011). Because of its geographical location, Morocco has favorable climate and environment for the cultivation of a rich and varied flora. Numerous research studies have focused on the inventory and identification of plant species in different regions (Bellakhdar, 1978; Chaachouay et al., 2019). As a result, nearly 42,000 species are identified, about 600 of these are used in traditional medicine (Mehdioui and Kahouadji, 2007; Lahsissene et al., 2009; Benkhnigue et al., 2011; El Hafian et al., 2014; Hachi et al., 2015; El Azzouzi and Zidane, 2015).

Despite the efforts made by the specialists, the analysis of the Moroccan medical bibliography shows that the data relating to the regional medicinal plants are very fragmentary and dispersed; therefore, the need to study them in a thorough way. In this perspective we propose an ethnobotanical study of the plants mostly used by the population of the Gharb region, as well as certain medical practices followed by users.

MATERIAL AND METHODS

Methodological information

The prospective survey was carried out over two years 2013-2014 on 30 stations including 10 urban communes and 20 rural communes. They were provided by a team from the botanical laboratory of the Faculty of Science of Kénitra. Interviews with respondents were conducted in the Arabic language and/or dialect of the region.

Botanical

The plants were collected randomly from 30 stations. Primary treatment includes washing, sorting and storage in accordance with National law and regulations. The taxonomic validation of the species was carried out in the laboratory using herbaria, catalogs and flora (Jahandiez and Maire, 1931; 1932; 1934; Emberger and Maire 1941; Sauvage, 1961; Quezel and Santa, 1962; 1963; Fennane et al., 1999).
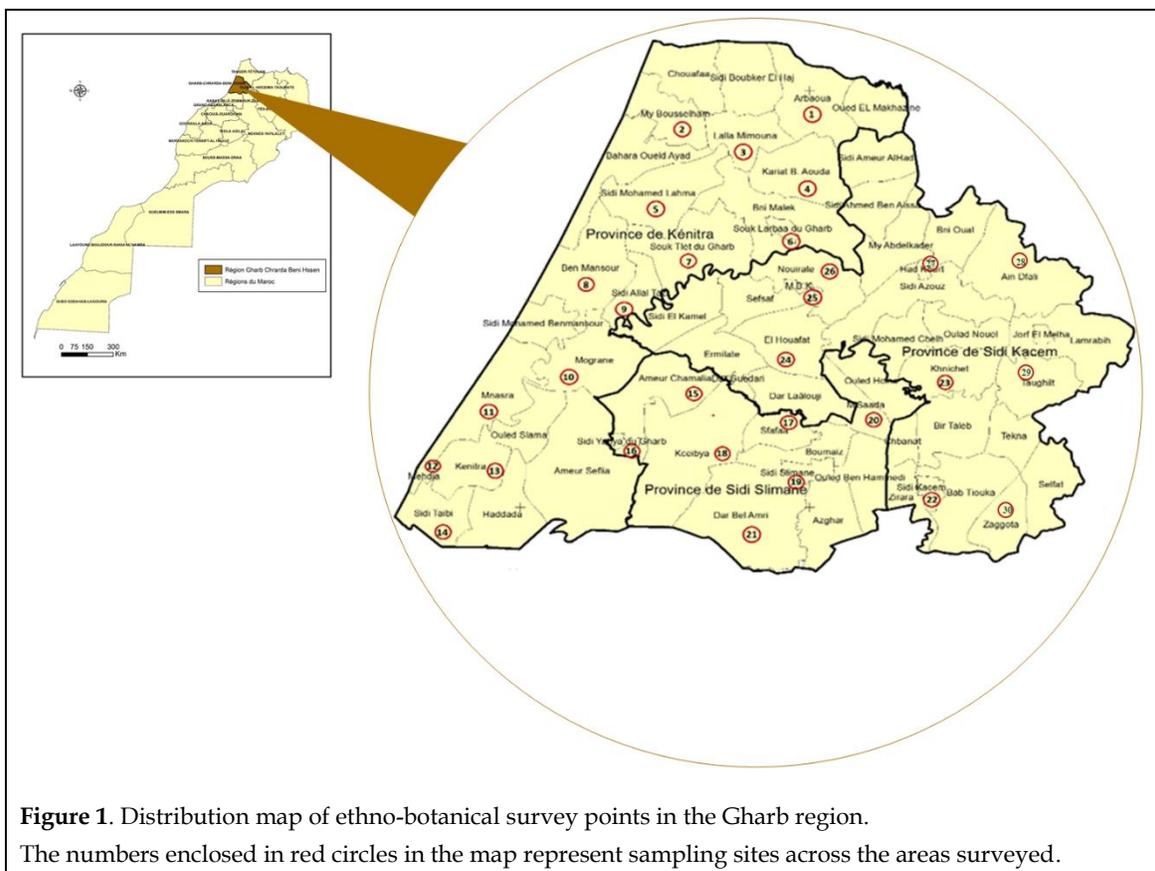
Anthropological

Survey and Data established in the laboratory and validated by experts in the field, was made available to respondents to complete it. It provided information on the respondent (age, sex, therapeutic practice, etc.) and the medicinal plants used (vernacular name, type of disease treated, part used).

Ethical information was noted progressively on cards bearing the number of the interviewee and in complete anonymity after respondents' consents.

Study zone

The Gharb region of Morocco (34°32'36.406"N 5°53'55.37"W), located in the northwestern part of the Kingdom, covers about 801,800 ha, which is about 1.1% of Morocco's surface area. Its population is estimated at 1,656,723 inhabitants, of which 56% is in rural areas, spread over the three provinces of the region (Kenitra, Sidi Kacem and Sidi Slimane). The climate of the region is Mediterranean, the average maximum temperatures vary between 22 and 23°C and the minimum temperatures between 14 and 17°C. The region has important natural and biological resources such as Sidi Boughaba Lake, Maâmora and Merja Zerka (Fig. 1). This figure represents the distribution of survey points in the region studied (Gharb region),

Figure 1. Distribution map of ethno-botanical survey points in the Gharb region.
The numbers enclosed in red circles in the map represent sampling sites across the areas surveyed.

the red points in the map below represent sampling sites across the areas surveyed.

Statistical analysis

After codification of the collected data, these were processed by static processing software. The results of the statistical analyzes are expressed as frequencies for the qualitative characteristics and as an average plus at least the standard deviation for the quantitative characters. The associations between the different variables were verified by a Khi-2 independence test with a 5% error.

Ethnobotanicals index

Medicinal use value

Medicinal use value (MUV) indicated the relative medicinal importance of plants known locally. MUV ranges from 0-1. MUV were high when there was many use-reports for a plant making the sense

that the plant was important and approaches zero (0) when there were a few use reports related to its use (Phillips and Gentry, 1993).

$$MUV = \sum MUi/N \qquad [1]$$

Where MUi: number of the mentioned medicinal uses by each informant for a given plant species and N: total number of informants included in the survey.

Family use value

Family use value (FUV) determined the importance of a family reporting various plants for their therapeutic potential (Ghasemi et al., 2013).

$$FUV= \sum UVs /ns \qquad [2]$$

Where $\sum UVs$: the use values of all the species reported by respected family and "ns" was the total number of species within a given family.

Relative Frequency of Citation (RFC)

The RFC (Tardío and Pardo-de-Santayana, 2008) was obtained by dividing frequency citation (FC) by total number of informants in the survey (N) according with equation [3].

$$RFC = FC/N \qquad [3]$$

Fidelity Level (FL)

Fidelity level (FL) was the percentage of informants who mentioned the uses of certain plant species to treat a particular ailment in the study area (Friedman et al., 1986). The FL index was calculated using the formula [4].

$$FL\,(\%) = Np/N \qquad [4]$$

Where Np: number of informants that claim a use of a plant species to treat a particular disease, and N is the number of informants that use the plants as a medicine to treat any given disease.

Informant Consensus Factor (ICF)

ICF was derived in order to seek an agreement between the inform-ants on the reported cures for each group of diseases (Heinrich et al., 1998).

$$ICF = (Nm - Ni) / (Nm - 1) \qquad [5]$$

Where Nm was the number of use-reports in each disease category and Ni was number of species used.

RESULTS

Socio-demographic characteristics of the respondents

The study was carried out on 704 individuals of whom 52.5% (n = 375) were female compared to 46.1% (n = 329) were male. The average age of these informants was 41.57 ± 0.51 years (minimum = 15 years and maximum = 84 years). The 82.95% (n = 584) of whom were married (female = 319, male = 265) *versus* 17.05% (female = 56, male = 64) were single. In addition, 70% of single respondents are aged 20 to 40 and 27.5% were under 20 years of age. While among married couples, 40.41% (n = 236) were between 20 and 40 years old and 48.63% (n = 284) were between 40 and 60 years old. The distribution of respondents by level of education shows that out of 320 illiterates 66.56% female (n = 213) against 33.44% male (n = 107). For those who reported having a primary or secondary level (n = 363), 58.40% (n = 212) were male *versus* 41.6% (n = 151) female (Table 1).

Characteristics of the therapeutic choice according to socio-demographic parameters

Table 2 presents the results of the Khi-2 test between the choice of treatment and certain socio-demographic parameters. In addition, sex showed a very highly significant effect on the choice of the type of medicine (p<0.008). On one hand the rate of females among respondents who had confidence in modern medicine was 35.56% *versus* 64.44% for males [Odds ratio = 0.46 and confidence interval at 5% error (CI) was (0.25 - 0.86)]. On the other hand, the rate of females relying on traditional medicine was 50.9% compared to 49.1% for males [Odds ratio = 0.83; 95% and CI= (0.62 - 1.12)]. The single rate for respondents who had confidence in modern medicine was 28.89% compared to 71.11% for married couples [Odds ratio = 2.1 and CI= (1.07 - 4.13)]. In other words, the rate of single people having confidence in Traditional Medicine (TM) was 14.07% compared to 85.93% for married couples (Odds ratio = 1.11; 95% CI= (0.75-1.65)]. However, more than 54% of illiterates believe seriously in traditional medicine and more than 41% had confidence in traditional medicine and modern medicine, while less than 4% had confidence in modern medicine (MM). Also, the age, was a determining factor of the therapeutic choice, the test Khi-2 confirmed this connection (p<0.023) of those who responded categorically with modern medicine (n = 45), 27 were under 40 and 18 were over 40. Among those surveyed who felt they had full confidence in traditional medicine (n = 334), 40.12% were between 20 and 40 years old and 54.49% were over 40 years old. In the end, 54.45% of respondents who said they believe in both types of medicine were under the age of 40.

Table 1. Socio-demographic characteristics of the respondents.

Variable	Modality	Female (n=375)	Male (n=329)
Age ± SD (years)		41.34 ± 13.47	41.82 ± 13.32
Marital status	Married	319	265
	Single	56	64
Level of education	Illiterate	213	107
	Secondary	151	212

SD: Standard deviation

Table 2. Cross-over study of therapeutic practice and selected sociodemographic parameters.

Variable		Therapeutic practice			Total (N=704)	Khi-2 (p-value)
		MM (n=45)	MT (n=334)	MTM (n=325)		
Gender	Female	16	170	189	375	9.54
	Male	29	164	136	329	(p<0.008)*
Marital status	Single	13	47	60	120	7.01
	Married	32	287	265	584	(p<0.03)*
Level of education	Illiterate	13	174	133	320	22.25 (p<0.001)*
	Primary	16	94	86	196	
	Secondary	13	61	93	167	
	University	3	5	13	21	
Age	<20	0	18	18	36	17.71 (p<0.023)*
	20 - 40	27	134	159	320	
	41 - 60	13	148	126	287	
	61 - 80	5	32	22	59	
	>80	0	2	0	2	

*Significant difference. MM: Modern medicine; MT: Traditional medicine; MTM: Traditional medicine and modern medicine.

Ethno-botanical characteristics

The ethno-botanical survey of the 704 respondents during the investigation period (2013/2014) resulted in 820 notifications, at a rate of 1.17 per respondent. This made it possible to compile a catalog composed of 187 plant species, divided into 156 genera and grouped into 71 families. Table (3) presents the results of the most cited species and their corresponding families such as *Lamiaceae*, *Amaryllidaceae*, *Amaryllidaceae*. The most commonly used parts of the plant were the leaves, seeds and stems. The method of preparation was very diverse such as decoction, and infusion (Table 3).

Medicinal use value (MUV)

The distribution of all species according to the number of uses showed that the latter varies from 1 to 9 possible uses. Due to the relatively high number of species identified, we focused on those

with a MUV range of between 2% and 3,1% (displayed for *Allium sativum* L.).

Family use value (FUV)

The distribution of the families of the most cited species in the region of the study fluctuated between a minimum importance value of 0.261 and a maximum value of 0.75 displayed respectively for the families of *Amaranthaceae* and *Apocynaceae*. However, the FUV recorded for the *Lamiaceae* family showed a medium important despite the large number of species cited for this family.

Table 3. Ethnobotanical presentation of the most used medicinal plants in the region.

Family / Scientific Name *	Vernacular name	Part used	Mode of preparation	Therapeutic use	FUV	MUV	RFC %
Lamiaceae					0.3		
Marrubium vulgare L.	Marriwtael-harra	Fe; Ec; Fr	Dec	M; G; N		0.027	7.8
Origanum compactum Benth.	Zaâter	Fe; Ti	Po	G		0.024	8.8
Mentha pulegium L.	Fliyou	Fe	Dec	M; G; R		0.02	8.5
Lavandula dentata L.	Lakhzama	Fe	Dec	G; N; U		0.02	8.14
Salvia officinalis L.	Salmiya	Fe	Inf	G; U		0.02	4.07
Amaryllidaceae					0.59		
Allium sativum L.	Touma	Fr	Cu	O; R; M		0.031	6.1
Allium cepa L.	Bassala	Bu	Dec	D; R; N		0.024	3.05
Myrtaceae					0.375		
Eucalyptus globulus Labill	Kalito.kalitous	Gr	Cr	O; R; M		0.027	9.49
Eugenia caryophyllata Thunb	Qoronfel	Fl; Fr; Bu		G; M; D		0.024	4.07
Oleaceae					0.53		
Olea europaea L.	Zitoun	Fe; Fr	Dec; Inf; Cr	M; D; R		0.027	5.08
Asteraceae					0.57		
Dittrichia viscosa L.	Terrahla	Fe; Ti; Pltent	Dec; Inf; Cr	M; D; G		0.027	4.75
Cucurbitaceae					0.636		
Citrullus colocynthis L.Schrad.	Lhdej	Fr; Ti; Gr	Dec; Cr	D; M; Os		0.024	3.73
Zingiberaceae					0.5		
Zingiber officinale Roxb	Skenjbîr. Zanjabîl	Rh; Bu	Inf; Po; Mac; Cru	O; R; Os		0.024	4.75
Rutaceae					0.6		
Citrus limon L. Burm.	El-hammed	Fr	Cru	G; D		0.02	3.39
Amaranthaceae					0.261		
Chenopodium ambrosioides L.	Mkhinza	Ti; Fe	Inf; Poudre; Dec; Cr	D; M;		0.02	7.8
Verbenaceae					0.428		
Lippi acitriodora H. B. & K.	Lwiza	Fe	Dec; Inf	N; G; M		0.02	4.75
Lauraceae					0.667		
Cinnamomum zeylanicum Nees.	Qarfa	Ec; Rh; Ti; Fe	Inf; Dec; Cat	CV; O; G		0.02	3.05
Apocynaceae					0.75		
Nerium oleander L.	ddefla	Fe; Ti	Cr; Dec	D; Dt		0.02	2.71

Ec: Ecorse; Fr: Fruit; Ti: Stem; Bu: Bulb; Gr: Seed; Fl: Flowers; Pltent: Whole plant; Rh: Rhizome; U: Urinary; D: Dermal; N: Neurologic; R: Respiratory; M: Metabolic; Os: Osteopathic; Dt: Dental; CV: Cardiac; G: Digestive; Cat: Poultice; Po: Powder; Mac: Maceration; Cr: Raw; Dec: Decoction; Inf: Infusion and Cu: Cooked. *: The scientific names were proposed according to Flora of Morocco volumes I, II and III (Jahandiez and Maire, 1931; 1932; 1934).
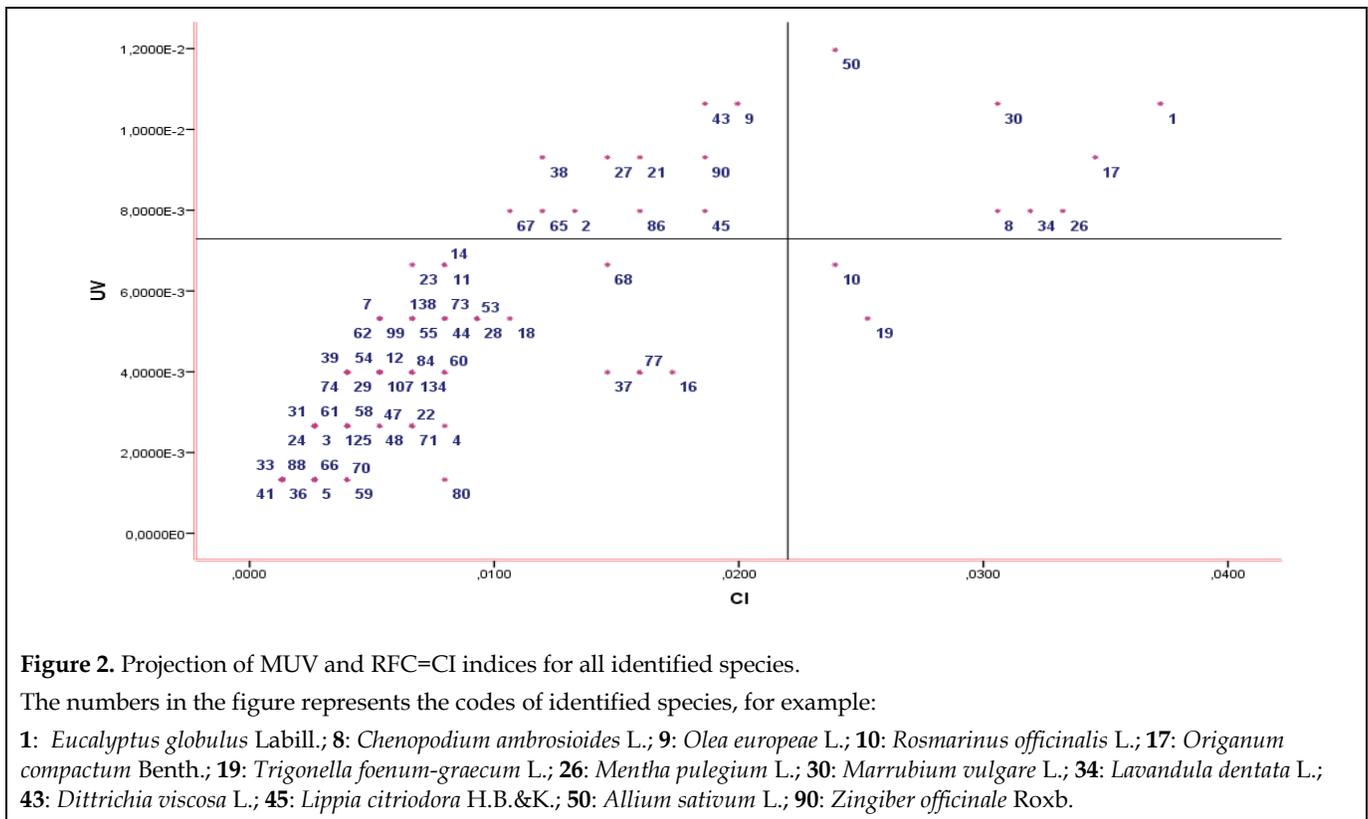
Figure 2. Projection of MUV and RFC=CI indices for all identified species.

The numbers in the figure represents the codes of identified species, for example:

1: *Eucalyptus globulus* Labill.; **8**: *Chenopodium ambrosioides* L.; **9**: *Olea europeae* L.; **10**: *Rosmarinus officinalis* L.; **17**: *Origanum compactum* Benth.; **19**: *Trigonella foenum-graecum* L.; **26**: *Mentha pulegium* L.; **30**: *Marrubium vulgare* L.; **34**: *Lavandula dentata* L.; **43**: *Dittrichia viscosa* L.; **45**: *Lippia citriodora* H.B.&K.; **50**: *Allium sativum* L.; **90**: *Zingiber officinale* Roxb.

Relative Frequency of Citation (RFC)=IC

The distribution of this parameter varied between 2.71% recorded for *Nerium oleander* L. and 9.49% displayed for *Eucalyptus globules* Labill.

In addition, Fig. 2 shows the scatter plot of the two MUV and RFC indices for all listed species. This graph shows that these two indices were very positively correlated, with a correlation coefficient of 0.845 and a regression equation of the order of Y = 2.43*X -0. 002. Furthermore, four groups of species have been defined:

The first group: Includes species with a high RFC and a high value of use (MUV). Indeed, this trend allow the appreciation of inter and intra cultural variations in the knowledge of the region respondents. These species are listed in order of importance: *Eucalyptus globules* Labill., *Origanum compactum* Benth., *Mentha pulegium* L., *Lavandula dentate* L., *Chenopodium ambrosioides* L., *Marrubium vulgare* L. and *Allium sativum* L.

The second group: It is composed of the much-used species but with moderately a low cultural importance. These species were: *Olea europaea* L., *Dittrichia viscose* L., *Zingiber officinale* Roxb, *Eugenia caryophyllata* Thunb, *Citrullus colocynthis* L. Schrad, *Allium cepa* L., *Lippia citriodora* H. B., *Salvia officinalis* L., *Citrus limon* L. Burm., *Cinnamomum zeylanicum* Nees. and *Nerium oleander* L.

The third group: It consisted only of the species *Trigonella foenum-graecum* L. *and Rosmarinus officinalis* L. whose index of importance was high, but the use was moderately low.

The last group: It gathers the rest of the species with both, an index of cultural importance and index of use, moderately low. Examples included *Alpinia officinarum* Hance., *Lawsonia inermis* L., *Punica granatum* L., *Petroselinum sativum*.

However, at the bottom of the diagram, respondents mentioned species, which had very low levels of RFC and MUV, such as *Cynara scolymus*

Table 4. Informant consensus factor and fidelity level of the respondent.

Disease	Fidelity level		Informant Consensus Factor (ICF)	
	Np	FL	ICF= Nm-Ni/ Nm-1	Degree
Respiratory	49	16.61%	0.5	High*
Urinary	95	32.20%	0.5	High*
Dermal	120	40.68%	0.45	Low
Dental	18	6.10%	0.29	Low
Neurologic	54	18.31%	0.36	Low
Metabolic	136	46.10%	0.45	Low
Osteopathic	27	9.15%	0.15	Low
Cancer	9	3.05%	0.5	High*
Cardiac	16	5.42%	0.13	Low
Ophthalmic	8	2.71%	0.43	Low
Digestive	188	63.73%	0.59	High*

L., *Quercus suber* L., *Clematis flammula* L., *Ammodaucus leucotrichus* Coss. & Hard., *Aloe socotrina* Lamk.

The Table 4 presents CFI results for each disease treated by the plants cited by respondents. This results in two levels of disease.

Informant Consensus Factor (ICF)

For more precision, it was calculated the cultural importance index (ICF) of Tardio and Pardo de Santayana (2008) used to appreciate the importance of a plant in a category of use. It appears, that this index fluctuated between a maximum importance value of 0,59 displayed for the species *Eucalyptus globules* Labill. to treat digestive diseases a minimal ICF of 0.13 marked for species with low MUV like cancer. The first level included diseases with a high degree of consensus plant/disease relationship and with an ICF greater than 0.5 such as respiratory diseases, urinary diseases, cancer and digestive diseases. These diseases were arranged in descending order of ICF. The second groups gather diseases with an ICF less than 0.5 such as metabolic diseases. The fidelity index fluctuated between a minimum value of 2.71% recorded for ophthalmological diseases and a maximum value of 63.73% for digestive diseases.

DISCUSSION

The valorization of natural resources is becoming a concern for many countries around the globe. As a result, in order to standardize the uses of plants in conventional healthcare systems, WHO (2000) has established recommendations on the efficacy of herbal medicines.

The main objective of the present work was the ethno-botanical study of the plants most used by the population of the Gharb region, validating new biological and medicinal characteristics. As a result, a prospective study through more than 30 sites was carried out, while respecting the conditions of a stratified logical sampling. More than 700 respondents from all age groups and both sexes were involved in this investigation. This study, at first, allowed drawing up a catalog composed of 187 plant species, divided into 156 genera and grouped into 71 families, but we have exposed the most cited species (18 species). Similar studies are being proposed by researchers in different regions of Morocco, with the aim of identifying and listing the most requested aromatic and medicinal plants, thus gathering information on therapeutic uses (Scherrer et al., 2005). Moreover, more than 200 species have been identified by means of central atlas by Hachi (2015), Alhouz-Rehamana by

Benkhnigue et al. (2011), Zaeer region by Lahsissene (2009), South-east of Morocco (Tafilalet) by El Rhaffari et al. (1999; 2002), Province of Essaouira by Mehdioui et al. (2007) and Slimani et al. (2016) in Fes region. According to the report of the aromatic and medicinal plants sector in Morocco, more than 4,200 species have been identified of which 800 endemic and 400 were classified as products for medicinal and/or aromatic use. In a second part, we calculated some characteristic indicators of the species most appreciated by respondents in the Gharb region. The results show that species with a high cultural index (CI) and a high use value (UV) were generally *Eucalyptus globules* Labill., *Origanum compactum* Benth., *Mentha pulegium* L., *Lavandula dentata* L., *Chenopodium ambrosioides* L., *Marrubium vulgare* L. and *Allium sativum* L. The results of the consensual factor of the FCI respondent showed a strong correlation between certain diseases and the use of these species in healing especially metabolic, respiratory, digestive and other diseases. These results were according with the study conducted by Mehdioui et al. (2007) in the region of Essaouira. They found that the listed plants had a healing power of 50% for digestive diseases and 10% for respiratory diseases as the species *Lavandula dentata* L., *Allium sativum* L. Another study conducted in Fez region by Zeggwagh et al. (2013), which confirmed the therapeutic aspect of the species identified in the healing of mainly digestive and respiratory diseases. According to Hmamouchi (1999), the species *Mentha pulegium* and *Origanum compactum* have been used as pulmonary antiseptic, expectorant, antis-spasmodic, stomachic, refreshing. Research studies showed that these species especially *Thymus vulgaris*, *Origanum compactum* and *Mentha pulegium* were more represented in folk medicine for the treatment of extra-oral (digestive, respiratory) and oral (gingival swelling, stomatitis) (Guessous, 2013). In comparison with other studies, more than 1123 plant species, more than 725 genera belonging to 183 families, are used for their hypoglycemic and antihyperglycemic properties (Eddouks et al., 2007). The study conducted in the Rif region by Chaachouay (2019) showed a high ICF for rheumatic diseases.

Among the limitations of the subject was that during the period of data collection we had difficulties to explain the objective of this review to the informants. Also, the lack of updated catalog for all the species listed in the region and the absence of a source of funding for the project, were a real obstacle.

CONCLUSIONS

The first results of this study confirmed that phytotherapy is undoubtedly the most adopted medicine by the local population of the Gharb region. Thus, we reported, a catalogue of therapeutic uses of medicinal plants used in this region. The qualitative analysis showed a strong association between the choice of this practice and certain socio-demographic characteristics (sex, family status, academic level and age). These medicinal plants are used primarily to treat disorders of the digestive tract with a consensual factor of 50%. The results of this ethno-botanical study and the calculation of the indicator showed that the plants mentioned by the respondents, represented the families *Myrtaceae, Lamiaceae, Zingiberaceae*, corresponding to the most cited species (n = 18).

Therefore, this work represents an important platform for further studies in the Gharb region, which is one of the richest areas from a botanical point of view. This study deserves to be continued, to complete the catalog of therapeutic uses.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTION:

Contribution	Bouayyadi L	Zidane L
Concepts or ideas	x	x
Design	x	x
Definition of intellectual content	x	x
Literature search	x	
Experimental studies	x	x
Data acquisition	x	x
Data analysis	x	x
Statistical analysis	x	
Manuscript preparation	x	x
Manuscript editing	x	x
Manuscript review	x	x

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