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Ethnobotanical Study and Biodiversity of Medicinal Plants Used in the Province of Taza North-Eastern Morocco

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ABSTRACT

Information about the traditional use of medicinal plants, as well as the development of the plant heritage in some regions of Morocco, is still poorly documented. The current survey conducted in the Bouchfaa commune, Taza province, aimed to collect and evaluate ethnobotanical information concerning the use of plants for therapeutic purposes by the indigenous people. The ethnobotanical survey targeted 600 people from different categories of age, gender, family situation, education level, etc. Data were collected using survey forms and analyzed through the relative frequency of citation (RFC), family importance value index (FIV), and plant part value (PPV). The study results showed 105 plant species belonging to 52 botanical families, of which the most used families in the study area are Lamiaceae (15 species) with FIV=41.37%, Apiaceae (7 species) with FIV=10.76%, Fabaceae (7 species) with FIV=19.42%, followed by Asteraceae (6 species) with FIV=16.36%. The most cited species are *Satureja calamintha* (RFC=64%), *Origanum compactum* (RFC=61%), *Thymus zygis* (RFC=60%), *Lavandula stoechas* (RFC=57%), and the least cited are *Vitis vinifera* (RFC= 0.5%). This analysis revealed that the most common diseases treated are related to digestive disorders. The UVs varied from 0.005 (*Satureja calamintha*) to 0.64 (*Vitis vinifera*), the highest FL (100%) was achieved in 37 species, the plants' leaves are the most used plant part, and decoction is the most frequent preparation method. According to the current survey, the indigenous people of the study region mainly use medicinal plants to treat diseases in spite of the development of modern medicine.

***Keywords*:** North-eastern Morocco, Medicinal plants, Ethnobotanical surveys, Traditional medicine.

Introduction

Traditional medicine focuses on natural resources, including medicinal and aromatic plants available in the local environment. Worldwide, medicinal plants are an important resource for the rural population. They use them to alleviate their pains, cure their ailments and heal their wounds through the therapeutic properties provided mainly by their active compounds that act directly on the body.[1] Medicinal plants have occupied a very important place in the daily life of humans, and they are a source of therapeutic medicines for humans and especially for poor households.[2] This is usually due to the low socio-economic level of most people, the lack of medical infrastructure, and the poor welfare and health indicators, especially in rural areas,[3] the use of plants as drugs is an integral part of the biocultural diversity of rural populations. Furthermore, the application of plants to treat and cure diseases has increased recently.[4,5]

Morocco is a country with a long history of traditional knowledge. The vast majority of rural populations use medicinal plants as remedies for diseases.[2] Historically, the populations of northeastern Morocco have developed an important information on the usage of medicinal plants in the health system through the accumulation and transmission of information from one generation to another or the mixture of cultures that originate from various regions of Morocco. Morocco has an important floristic wealth with about 743 taxa, of which 40 are endemic medicinal plants thanks to its geographical, geological, topographical and climatic.[6] Indeed, ethnobotanical studies are effective means of identifying and documenting medicinal plants.[7] The population growth, its increasing demand and excessive use is threatening medicinal plants with extinction.[5,8] The medicinal and aromatic plants (MAPs) present real opportunities for development based on socio-economic valorization as local resources.[2] Currently, despite spectacular progress in the synthesis of various active products, demand for MAPs and their derivatives has increased exponentially worldwide, and the exploitation of this heritage suffers from a lack of precise knowledge on the variability of MAP species. Therefore, it is important to value and preserve our natural resources and to maintain them through improvement and domestication.

The aim of the current ethnobotanical study is to survey the population of the Bouchfaa commune in the northern province of Taza in Morocco, a hinge zone between the Rif and Middle Atlas Mountain ranges. It is a mountainous area encompassing the Tezeka Park which is characterised by an original and rich phytobiodiversity, of which 64 taxa are strictly endemic.[9] The richness of the flora is the result of its geographical position, edaphic structure, geological history and climatic conditions. The survey was conducted to gather information on the traditional knowledge of medicinal plants in this region in order to **(i)** identify the medicinal plants most used by the population through the ethnobotanical approach, **(ii)** save the valuable knowledge on the use of medicinal plants by the population of the region, **(iii)** enhance the plant and cultural heritage of the study area.

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Materials and Methods

Study area presentation

The current ethnobotanical survey was conducted in 25 customs of the commune of Bouchfaa (Figure 1). The commune of Bouchfaa is part of the province of Taza, North-eastern Morocco, covers an area of 161 km^2 and is subdivided into 25 customs, with an estimated population of around 10 724 inhabitants in 2014. It is a hinge zone between the Eastern Middle Atlas and the Rif, it is located at an altitude of 650 m and bordered to the North by the rural commune of Ghiyata Gharbia, to the East by the rural commune of Bab Idir, to the South by the rural commune of Smiâa and to the West by the rural commune of Bouhlou and Matmata (Figure 2). The region's climate is the Mediterranean, characterised by a cold winter and a hot summer. The average temperature of the study area varies between 9 and 45 °C, and the average annual precipitation is approximately 780 mm, with a maximum of 1800 mm at Jbel Tezeka. This municipality is crossed by several wadis, such as Oued Azehar, Oued Bouzeghou, Oued Aslen, Oued El kehal, Oued Sahla, Oued Rmila, and Oued El Kaf, it is also characterised by its mountainous geomorphological nature and the diversity of its landscapes with mountains (65%), plains (28%), hills (16%) and also caves. Moreover, it is characterized by its richness in plant resources, including medicinal plants (Regional Directorate of Water, Forests and the Fight against Desertification, north-eastern province Taza).

Ethnobotanical survey

For the purpose of collecting information on the traditional uses of medicinal plants by the local population of the Bouchfaa commune, we conducted ethnobotanical surveys presented to the inhabitants and herbalists, and then we made field trips to make observations about the plant formations as well as to determine the plants that are most exploited in the study area during the period from December 2020 to December 2021. The first part consists of specific questions about the informant (age, gender, level of education, family situation, profession, and origin of information) and the second part concerns the plant material (name of the plant, nature of its use, parts used, method of preparation, etc.), the method of preparation, the parts used, the administration and conservation methods, the dose used, the plant type, the toxicity, the period of collection, the results obtained and the undesirable effects, the survey was carried out at random with 600 people who were natives and/or had lived for a long time in the commune.

Plant, collection, handling and identification

The plants used by the local population of the region were collected from March to June 2021 in Bouchfaa commune, Taza, Morocco and identified by Prof. Amina Bari (Botanist), in the department of biology, Laboratory of Biotechnology, Environment, Agri-food and Health, Faculty of Sciences Dhar El-Mahraz, Sidi Mohamed Ben Abdellah University, Fez, Morocco. These plants were assigned voucher numbers (All voucher numbers included in table 3) and conserved in the university's Herbarium as a database of plants used in the study area.

Indices analysis

Use value

The use-value index (UV) assesses the relative importance of each plant species known locally to be used as a medicinal plant. The use-value was calculated according to the following formula:

$$UV = U/N$$

Where UV is the use-value of a species; U refers to the number of citations per species, and N is the number of informants who reported on the plant species.[10]

Relative frequency of citation (RFC)

RFC is a coefficient that calculates the importance of each species in the area under study. It is calculated by dividing the number of respondents who cited the species (FC) by the total number of respondents (N).[11]

$$RFC = FC/N \ (0 < RFC < 1)$$

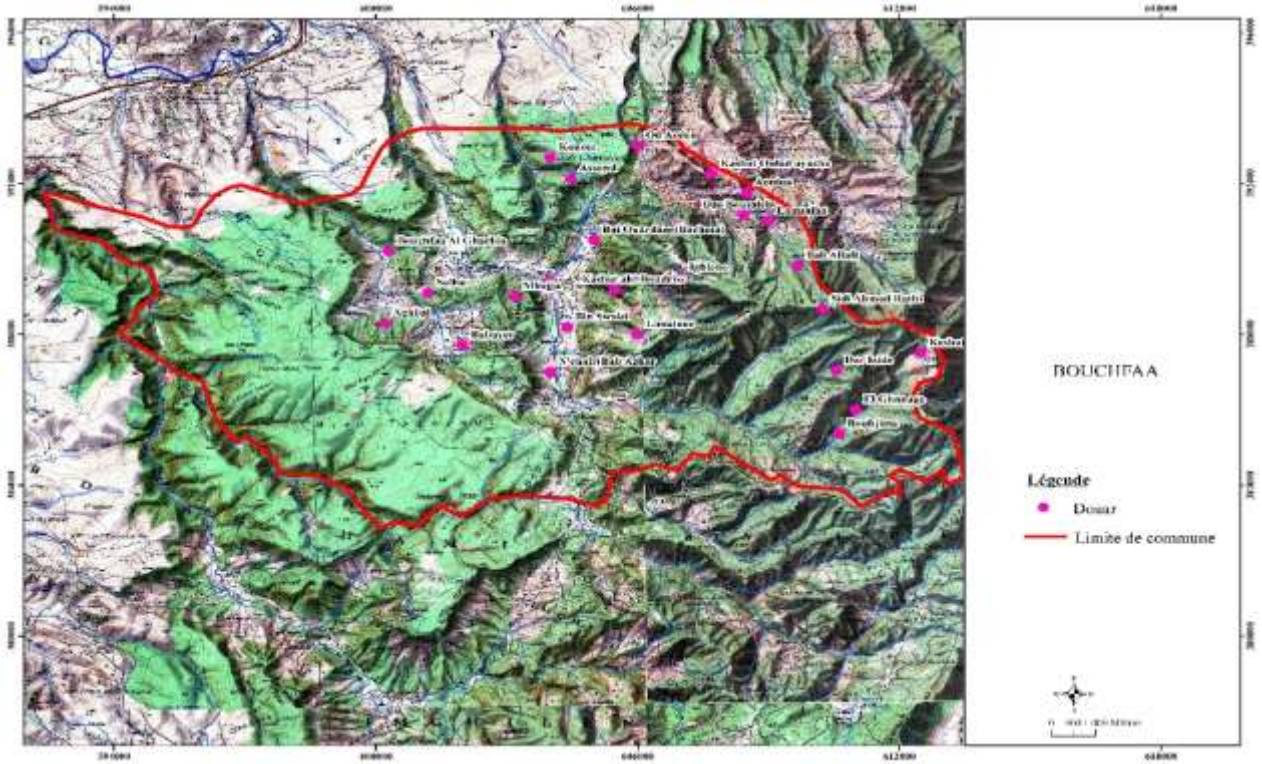

Figure 1: Map of 25 survey points studied in the Bouchfaa commune. The map was designed with QGIS software.

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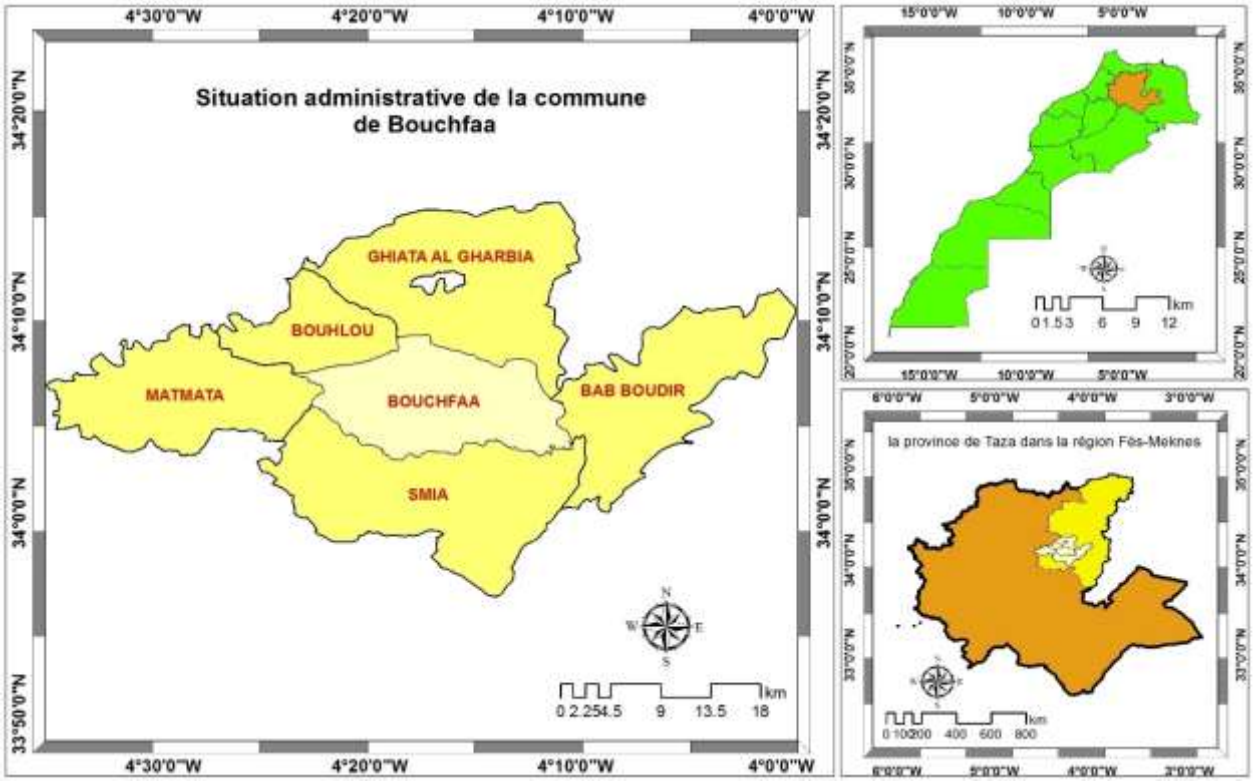

Figure 2: Site of ethnobotanical survey. The map was designed with QGIS software.

Family importance value (FIV)
FIV indicates the relative importance of families. It is used to assess the biological taxonomic value of plants, as determined by the division of the number of respondents reporting the family (FC_{family}) by the number of species within each family (N_S):[12]

$FIV = FC_{family} / N_S$

Value of the plant part (VPP)
VPP reflects the frequency of use of each of the plant parts. It is calculated by dividing the number of reported uses for all plant parts ($RU_{plant\ part}$) by the total reported uses by one plant part (RU):[13]

$VPP = RU_{plant\ part}/RU$

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

FL (%) = Np/N x 100

Where Np=Number of informants who report using a plant species to treat a particular disease and N is the total number of informants who reported all uses of a given plant species.[14]

Relative importance (RI)
Relative importance (RI) of species X = number of use categories of species X divided by the number of use categories for the most versatile species plus the number of pharmacological properties of species X divided by the number of pharmacological properties of the most versatile species.[15]

Cultural value index (CV)
Cultural value index (CV) of species X = number of use categories of species X divided by the total number of use categories multiplied by the number of informants mentioning species X as useful divided by the total number of informants multiplied by the total number of use reports in all use categories of species X divided by the total number of informants.[16]

Statistical analysis
The results of the surveys were entered and processed using Microsoft Excel 2016 for Windows and GraphPad Prism 9. The significance of the difference between the Socio-demographic profile of the respondents was tested by analysis of variance (One-ANOVA). Tukey's multiple range tests at $p < 0.05$ was performed using GraphPad Prism 9.[17] Principal component analyses were performed using Minitab 19.1.1 software.[17]

Results and Discussion

Demographic characteristics of respondents
Usage of medicinal plants according to age
People in the 51-60 age group use medicinal plants frequently with frequency of 27%, followed by people aged between 41 and 50 with a frequency of 24.34%. In the same vein, the 31-40 age group and people over 60 use medicinal plants with a frequency of about 17.66% for the first category and 16% for the second category. Moreover, the poor use of medicinal plants is observed among the youngest age group of 20-30 and people under 20 with a frequency rate of 11.34% and 3.67% respectively, which means that older people have more knowledge about the traditional practices of medicinal plants compared to the younger age group which has less knowledge about the use of medicinal plants (Table 1). The same results were found by other ethnobotanical surveys conducted in the province of Taza,[18] and other surveys carried out in other regions of Morocco.[3,19,20] Thus, endangering the conservation of local knowledge as reported by previous studies and internationally.[1,21]

Use of medicinal plants according to gender
Women frequently used medicinal plants to treat diseases with a frequency of 55.33% compared to men who used them, only 44.67% (Table 1). The results are comparable to other studies conducted in the same province[18] or other regions of Morocco[3,22] or international.[23,24,25] This is explained by the fact that women are in charge of household activities and use medicinal plants to prepare meals as well.

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Table 1: Socio-demographic profile of the respondents in the Bouchfaa commune, Taza province (North-eastern Morocco)

Variable	Sub-group	Number (N = 600)	Percentage (%)
Age (mean years SD)	≤ 20	22	3.67[a]
	20 ≤ 30	68	11.33[b]
	> 30 ≤ 40	106	17.67[c]
	> 40 ≤ 50	146	24.33[d]
	> 50 ≤ 60	162	27.00[e]
	> 60	96	16.00[c]
Gender	Woman	332	55.33[a]
	Man	268	44.67[b]
Study level	Analphabetic	358	59.67[a]
	Primary	104	17.33[b]
	Secondary	88	14.67[b]
	University	50	8.33[c]
Family status	Single	62	10.33[a]
	Married	502	83.67[b]
	Divorced	36	6.00[c]
Profession	Functionary	26	4.34[a]
	Trader	18	3.00[a]
	Doctor	2	0.33[b]
	Housewife	280	46.67[c]
	Engineer	2	0.33[b]
	Farmer	90	15[d]
	Employee	88	14.67[d]
	Student	20	3.33[a]
	Teacher	5	0.83[b]
	Driver	14	2.33[a]
	Soldier	8	1.33[b]
	Herbalist	32	5.34[a]
	Others	15	2.5[a]
Information source	Bibliography	24	4.00[a]
	Herbalist	186	31.00[b]
	Experience of others	390	65.00[c]

The percentages of each variable denoted by different letters indicate significant difference according to Tukey's multiple range tests at $p < 0.05$.

Use of medicinal plants according to educational level

According to our results, the most frequently used medicinal plants are among illiterates with a rate of 59.67%, followed by primary and secondary school graduates, who represented 17.33% and 14.67%, respectively. Whereas university graduates represented the lowest rate with 8% (Table 1). The analysis of the data obtained revealed that the majority of the respondents are not sufficiently educated. This, in turn, explains the oral transmission of information from generation to generation. The present results are also similar to other studies.[3,9,18,19,26]

Information Source

The surveyed population had several sources of information about the use of medicinal plants, 65% obtained information from the experience of others, and 31% from herbalists. While only 4% get the information from their reading (Table 1). The current results are in line with those of other studies done in different regions of Morocco.[27,28,29]

Family situation

In the current study, married individuals have a higher use of herbal medicines with a percentage of 83.67%, whereas single individuals have a very limited interest in herbal medicines with a percentage of 10.33%. Divorced people use medicinal plants in this region with a rate of 6% (Table 1), similar results obtained in other studies.[27,30,31]

Profession

The usage of medicinal plants is higher among housewives (46.67%), whereas it is less frequent among farmers and employees with a rate of 15% and 14.6% respectively, and rarely among herbalists (5.33%) and other professions (less than 5%) (Table 1).

The percentages of each variable denoted by different letters indicate significant difference according to Tukey's multiple range tests at $p < 0.05$.

Correlations between the socio-demographic parameters of the surveyors

To better understand the source of information used by the respondents in our survey, table 2 provides a correlation between the source of information and the socio-demographic variables of the respondents. The older and illiterate informants mainly rely on the experiences of others and herbalists as sources of information. The results obtained indicate a significant correlation, firstly, between the source of information and the level of education, and secondly, between the source of information and the socio-economic level. Furthermore, to understand the correlation between the different socio-demographic variables studied, figure 3 summarizes the results of correlations between the different socio-demographic parameters of the informants, carried out by principal component analysis.

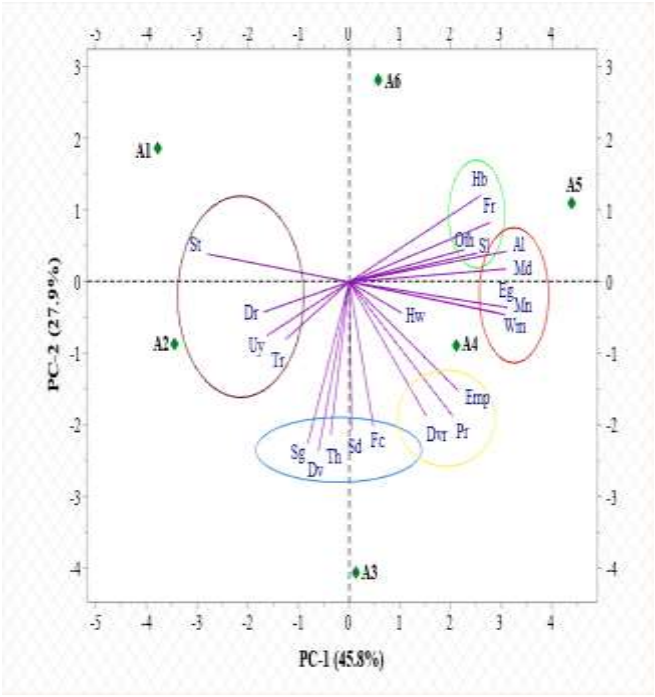

Figure 3: Principal component analysis in the C1-C2 plane presents the correlations between the socio-demographic variables of the respondents.

A1: age ≤ 20, A2: > 20 age ≤ 30, A3: > 30 age ≤ 40, A4: > 40 age ≤ 50, A5: > 50 age ≤ 60, A6: age > 60, Wm: woman, Mn: man, Al: analphabetic, Pr: primary, Sd: secondary, Uy: university, Sg: single, Md: married, Dv: divorced, Fc: functionary, Tr: trader, Dr: doctor, Hw: housewife, Eg: engineer, Fr: farmer, Emp: employee, St: student, Th: teacher, Dvr: driver, Sl: soldier, Hb: herbalist, Oth: Others.

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Table 2: Correlation between information source and socio-demographic variables

		Information source			R Pearson	*P-value*
		Bibliography	**Herbalist**	**Experience of others**		
Age	≤ 20 (N=22)	0	8	14	0.786	0.0005
	> 20 ≤ 30 (N=68)	16	26	26		
	> 30 ≤ 40 (N=106)	8	32	68		
	> 40 ≤ 50 (N=146)	0	28	108		
	> 50 ≤ 60 (N=162)	0	62	108		
	> 60 (N=96)	0	30	66		
Study level	Analphabetic (N=358)	0	190	168	0.912	0.007
	Primary (N=104)	0	34	70		
	Secondary (N=88)	30	14	44		
	University (N=50)	32	5	13		
Socio-economic level	High (N=50)	40	3	7	0.733	0.0002
	Medium (N=260)	60	89	111		
	Low (N=290)	20	70	200		

The results obtained are in agreement with several ethnobotanical surveys that demonstrate a use of bibliography, including books and/or visits to local herbalists to supply botanical information.[30,32]

Medicinal species used

Distribution of medicinal plants

The ethnobotanical survey in the rural commune of Bouchfaa, province of Taza, allowed the identification of a variety of medicinal plant species used by the local population for disease treatment. The various species identified are summarized in table 3 with their scientific name, voucher number, genus, the part used as well as data on the level of fidelity (FL), the frequency of citation (RFC), the family importance value (FIV), the use-value index (UV) and the value of the part of the plant (VPP).

The floristic study of the species identified 105 species of plants from 52 botanical families used by the population of the Bouchfaa commune of Taza province (table 3). The most represented families in the study area are Lamiaceae (15 species) with FIV=41.37%, Apiaceae (7 species) with FIV=10.76%, Fabaceae (7 species) with FIV=19.42% and Asteraceae (6 species) with FIV= 16.36%. The four previous families are more represented in other ethnobotanical surveys carried out in the Fez-Meknes region of Morocco[30,32,33] and other regions of Morocco.[34,35,36]

Commonly treated diseases and diagnostic

The majority of the people interviewed use medicinal plants to treat digestive troubles with a rate of 19.68%, respiratory system affections with a rate of 9.93%, diabetes with a rate of 9.12%. Other respondants indicated average use of medicinal plants for other pathologies, such as skin affectation (6.45%), haircare (6.20%); and lower use for other pathologies with a rate varying between 1.79% for Burn treatment and 0.01% for asthma (table 4). The mentioned results are similar to other studies conducted in the different Moroccan regions, especially those concerning the most dominant pathologies like the digestive system and the respiratory.[3,31,37] The majority of the respondents (69%) use their ascendant's experiences to diagnose diseases, while 22% request herbalist to recognise their ailments, but only 9% diagnose the diseases themselves (Figure 4).

Used plant parts and Conservation status

The different parts of the plants are used for the treatment of pathological and dietary diseases in the study area. The leaves are the most used part with PPV=0.313, the aerial part comes second with VPP=0.135, followed by fruits (VPP=0.125), seeds (VPP=0.115), roots (VPP=0.090), flowers (VPP=0.083), stems (VPP=0.066), peel (VPP=0.021), whole plant (VPP=0.016), bulb (VPP=0.013), and rhizome (VPP=0.013) (Figure 5). These results represent some similarities with other studies including the study of [26,30,38] this being explained by the circumstance that leaves are the seat of photosynthesis and storage of secondary metabolites responsible for biological properties.[39,40] The majority of the surveyed population (68%) kept the plants exposed to light, 28% of the respondents kept shielded from light, and only 4% of the respondents used other conservation methods (Figure 6).

Mode of preparation and administration

The local population of the commune Bouchfaa use different modes to prepare of medicinal plants. Decoction represents the mode of preparation most used by the respondents to extract the active substance of plants with a rate of 32%. The infusion comes second with a rate of 28%, followed by the maceration with a percentage of 9% and the raw with a rate of 7.5%. For the other preparation modes, including cooking, juicing, essential oils, fumigation, cataplasm and other modes represent a cumulative percentage of 23.5% (Figure 7). The same finding was reported in studies carried out in other Moroccan regions.[19,21,30,34] The methods of administration of medicinal plants are varied. In this study, most plants (47.16%) are taken orally, 14.83% externally and 10.33% by rinsing, 8.66% by gargling, 7.66% by massage, 7.33% by swabbing and only 4% by inhalation (Figure 8).

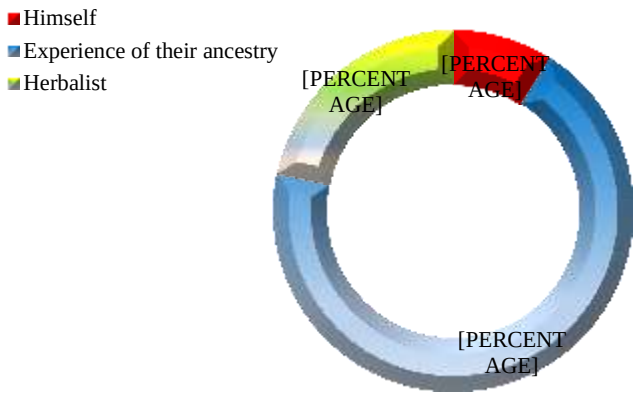

Figure 4: Methods of disease diagnosis used by the participants.

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Table 3: Biodiversity of medicinal plants used in the study area

Family and species names (voucher-specimen number)	Local name	Plant Part used	Preparation Mode	Administration mode	Local uses	No. of citation	UV	RFC	RI	CV	FL	FIV
Agavaceae												**3.33**
Agave americana L. (2018Bou/Aa00112)	Sabera	Lv, St	Liquid extract	Externally	Skin disease, haircare	20	0.028	0.033	2.125	0.0007	85	
Amaranthaceae												**0.66**
Beta vulgaris L. (2018Bou/Bv00212)	L-barba	Bl	Cru Juice	Orally	Cardiovascular disease, skin disease, genito-urinary disease, digestive problems	4	0.005	0.006	1.5	0.00002	75	
Anacardiaceae												**27.50**
Pistacia atlantica Desf. (2018Bou/Pa00312)	El-btem	Lv	Powder Decoction	Externally Brushing	Obesity, haircare	80	0.130	0.133	2.125	0.006	97.5	
Pistacia lentiscus L. (2018Bou/Pl00412)	Drou	Lv	Decoction	Orally	Digestive problems	250	0.416	0.416	1.125	0.057	100	
Apiaceae												**10.76**
Apium graveolens L. (2018Bou/Ag00512)	Krafas	Lv, Sd, Ap, Wp	Powder Juice Infusion	Orally	Digestive problems, cold problem	80	0.125	0.133	2.03	0.009	93.75	
Carum carvi L. (2018Bou/Cc00612)	El karwia	Fr, Sd	Infusion Decoction	Orally	Digestive problems, sedative	70	0.115	0.116	1.25	0.0054	98.57	
Coriandrum sativum L. (2018Bou/Cs00712)	Quasbor	Lv, Sd, Ap	Infusion Juice Decoction	Orally	Sleep disorders, intestinal disease, diabetes	87	0.141	0.145	1.375	0.0092	97.7	
Cuminum cyminum L. (2018Bou/Cc00812)	El-kamoun	Sd	Decoction Infusion	Orally	Food poisoning, insect bites, intestinal disease	97	0.155	0.161	1.375	0.0086	95.78	
Foeniculum vulgare Mill. (2018Bou/Fv00912)	Nafaâ, Besbass	Sd	Powder Infusion	Orally	Digestive problems, sedative, appetite stimulation	15	0.023	0,025	1.375	0.00033	93.33	
Petroselinum sativum Hoffm. (2018Bou/Ps01012)	Maâdnous	Lv, Sd, Ap, Wp	Powder Infusion Decoction	Orally	Digestive problems, kidney disease, liver disease, rheumatological disease	60	0.095	0.1	1.5	0.0065	95	
Visnaga daucoides Gaertn. (2018Bou/Vd01112)	Bouchnikh	Fr, Sd, Ap, St	Infusion Maceration Decoction	Orally	Mouth disease, diabetes	43	0.070	0.071	1.25	0.00321	97.67	
Apocynaceae												**23.83**
Nerium oleander L. (2018Bou/No01212)	Dafla	Lv, St, Ap	Decoction Infusion Fumigation Cataplasm	Orally	Cancer, diabetes, fever, haircare	143	0.235	0.238	2.375	0.0583	67.83	
Arecaceae												**9.33**
Chamaerops humilis L.	Dom	Lv, Fr	Decoction	Orally	Digestive problems, liver	56	0.090	0.093	1.25	0.003	98.60	

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(2018Bou/Ch01312)			Infusion		disease						
Aristolochiaceae											**33.33**
Aristolochia longa L. (2018Bou/Al01412)	Bereztem	Lv, Sd, Rt, Rh	Powder Decoction Maceration	Orally	Cancer, digestive problems, kidney disease, skin disease	200	0.328	0.333	1.5	0.0471	98.5	
Asteraceae											**16.36**
Artemisia absinthium L. (2018Bou/Aa01512)	Chiba	Lv, St, Ap	Infusion Cataplasm Fumigation Decoction	Orally	Liver disease, mouth disease, hearing loss	83	0.133	0.138	1.375	0.031	96.38	
Artemisia herba-alba Asso. (2018Bou/Ah01612)	Chih	Lv, Fl, Rt	Decoction	Orally	Diabetes, anti-inflammatory, sedative, stomach pain, cold problems	102	0.166	0.17	1.625	0.0178	98.03	
Matricaria chamomilla L. (2018Bou/Mc01712)	Babounj romi	Lv, Fl	Decoction Infusion Powder	Orally, Externally Rinsing	Digestive problems, sedative, haircare, eye disease, allergy	150	0.241	0.25	2.5	0.048	96.66	
Conyza canadenis L. (2018Bou/Cc01812)	El atassa	Lv	Powder Cataplasm	Brushing	Skin disease	69	0.115	0.115	1.125	0.0044	100	
Cynara scolymus L. (2018Bou/Cs01912)	Khorchef	Fl, Rt	Powder Maceration Decoction	Orally	Digestive problems	56	0.093	0.093	1.125	0.0028	100	
Dittrichia viscosa (L.) Greuter (2018Bou/Dv02012)	Magraman	Lv, Sd, Rt	Powder Infusion Decoction	Externally Orally	Skin disease, cancer, digestive problems	129	0.200	0.215	1.375	0.018	93.02	
Brassicaceae											**5.55**
Brassica rapa L. (2018Bou/Br02112)	Left	Lv	Infusion Juice Cru	Orally	Cold problem	10	0.016	0.016	1.125	0.00008	100	
Lepidium sativum L. (2018Bou/Ls02212)	Habb erchad	Sd	Powder Decoction	Orally	Pulmonary problems, digestive problems, respiratory disease, cold problems, eye disease, obesity	80	0.126	0.133	1.75	0.008	95	
Sinapis arvensis L. (2018Bou/Sa02312)	Bouhamo	Lv	Infusion Decoction	Orally	Cold problems, kidney disease	10	0.015	0.016	1.375	0.0001	90	
Cactaceae											**6.67**
Opuntia ficus-indica (L.) Mill. (2018Bou/Of02412)	Handiya	Lv, Fl, Fr	Food Essential oil	Externally Orally	Haircare, cysts, rheumatological disease	40	0.063	0.066	2.25	0.002	95	
Capparaceae											**26**
Capparis spinosa L. (2018Bou/Cs02512)	Kabbar	Fl, Fr	Powder Infusion	Orally Brushing	Skin disease, stomach pain, cold problem,	156	0.253	0.26	1.5	0.024	97.43	

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					rheumatological disease						
Caryophyllaceae											**18.50**
Herniaria hirsute L. (2018Bou/Hh02612)	Harass elhajer	Fl, Ap	Infusion	Orally	Kidney disease	122	0.203	0.203	1.25	0.0137	100	
Saponaria officinalis L. (2018Bou/So02712)	Tighicht	Lv, Sd, Rt	Decoction	Orally	Skin disease	100	0.166	0.166	1.125	0.009	100	
Chenopodiaceae											**46.66**
Chenopodium ambrosioides L. (2018Bou/Ca02812)	Mkhinza	Lv, Ap	Decoction Juice Cru	Externally Rinsing	Fever	280	0.466	0.3	1.125	0.072	100	
Cupressaceae											**43.25**
Tetraclinis articulata (Vahl) Mast. (2018Bou/Ta02912)	El-aaraar	Lv, Fr	Decoction Powder Fumigation	Orally Rinsing	Digestive affection, haircare	230	0.335	0.383	2.125	0.049	87.39	
Juniperus phoenicea (2018Bou/Jp03012)	El-aaraar lhour	Lv, Fr	Decoction Fumigation Powder	Orally Rinsing	Genito-urinary disease, cardiovascular disease, digestive affection, skin disease, neurological disease	289	0.336	0.481	1.625	0.0129	69.89	
Ericaceae											**26.66**
Arbutus unedo L. (2018Bou/Au03112)	Bakhano	Lv, Fr	Decoction	Orally	Diabetes, kidney disease	160	0.166	0.266	1.25	0.0243	62.5	
Fabaceae											**19.43**
Ceratonia siliqua L. (2018Bou/Cs03212)	El kharob	Lv, Fr	Powder Decoction	Orally	Digestive affection, antibacterial	249	0.408	0.415	1.25	0.044	98.39	
Cicer arietinum L. (2018Bou/Ca03312)	Lhemmes	Sd	Decoction Powder Maceration	Orally	Diabetes	111	0.185	0.185	1.125	0.0114	100	
Vicia ervilia (L.) willd. (2018Bou/Ve03412)	Kersana	Sd	Maceration Powder Decoction	Orally	Diabetes	133	0.221	0.221	1.125	0.0162	100	
Retama raetam (Forssk.) (2018Bou/Rr03512)	Ratam	Ap	Powder Infusion	Massage	Skin disease	98	0.163	0.163	1.125	0.0088	100	
Glycyrrhiza glabra L. (2018Bou/Gg03612)	Ark Sous	Rt, Rh	Decoction Powder	Orally Gagarism	Respiratory disease, digestive problems, pulmonary disease, liver disease, mouth disease	23	0.016	0.038	1.625	0.0005	43.47	
Medicago sativa L. (2018Bou/Ms03712)	Lfasa	Lv, St, Ap	Infusion Decoction	Orally	Genito-urinary disease, digestive disorder, metabolic disorder	12	0.02	0.02	1.375	0.0001	66,66	
Trigonella foenum graecum L. (2018Bou/Tf03812)	Lhalba	Sd	Powder Decoction Infusion Maceration	Orally	Weight gain, hypertension, digestive disease, diabetes, cold problem	190	0.013	0.316	1.625	0.071	94.73	

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Fagaceae											**2.83**
Quercus suber L. (2018Bou/Qs03912)	Albalot	Lv, Fr	Decoction Powder	Brushing	Skin disease, digestive disease	17	0.028	0.028	1.25	0.0002	88.23	
Gentianaceae											**2**
Centaurium erythraea Rafn. (2018Bou/Ce04012)	Kassat Lhaya	Lv, Fl, Ap	Infusion	Orally	Diabetes	12	0.300	0.02	1.125	0.0001	100	
Iridaceae											**38.33**
Crocus sativus L. (2018Bou/Cs04112)	Zaafran L'hor	Fl	Infusion Maceration	Orally	Cardiovascular disease, neurological disease, kidney disease	230	0.025	0.383	1.375	0.0516	97.82	
Juglandaceae											**14.5**
Juglans regia L. (2018Bou/Jr04212)	Swak, El Gargaa	Lv, Fl, Fr, Rt	Decoction	Orally Rinsing Gagarism	Digestive disease, haircare, mouth disease	87	0.02	0.145	2.25	0.0098	93.10	
Juncaceae											**1**
Juncus acutus L. (2018Bou/Ja04312)	Assemar	Ap	Decoction Infusion	Orally	Skin disease, respiratory disease	6	0.375	0.01	1.125	0.00003	83.33	
Lamiaceae											**41.37**
Ajuga iva L. Schreb (2018Bou/Ai04412)	Chendgura	Lv, Rt	Infusion Decoction	Orally Gagarism	Digestive disease, cardiovascular disease, mouth disease, pulmonary disorder	120	0.135	0.2	1.5	0.015	99.16	
Satureja calamintha nepeta (2018Bou/Sc04512)	Manta	Lv, St, Ap	Decoction Infusion Powder Essential oil	Orally Massage	Digestive disorder, cold problem, sedative, anti-inflammatory, cough, fever, respiratory disease	389	0.008	0.648	2.125	0.50	77.12	
Lavandula multifida L. (2018Bou/Lm04612)	Hlihla	Lv, Rt, Ap	Decoction Infusion Cooked	Orally	Genito-urinary disease, respiratory disease	260	0.198	0.433	1.125	0.0624	98.84	
Origanum compactum Benth. (2018Bou/Oc04712)	Zaater	Lv, Sd, Ap	Decoction Infusion Maceration Powder Essential oil	Orally Massage Rinsing Inhalation	Cold problem, genito-urinary disease, respiratory disease, digestive problems, appetite stimulation	367	0.500	0.611	1.75	0.0278	98.09	
Origanum majorana L. (2018Bou/Om04812)	Mardadouch	Lv, Ap	Powder Infusion Decoction	Orally Gagarism	Cancer, mouth disease, sedative, hypertension, allergy, cough	250	0.428	0.416	1.78	0.076	98	
Rosmarinus officinalis L. (2018Bou/Ro04912)	Azir	Lv, Rt, Ap	Decoction Infusion Essential oil	Orally Rinsing Massage	Digestive problems, burn treatment, sedative, blood circulation stimulation, anti-inflammatory, cold problems, haircare	200	0.600	0.333	2.875	0.059	95.5	
Salvia officinalis L.	Salmiya	Lv	Infusion	Orally	Digestive disease, diabetes,	120	0.408	0.2	2.375	0.0233	98.33	

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(2018Bou/So05012)			Decoction	Externally Rinsing	face care hypertension							
Thymus zygis (2018Bou/Tz05112)	Zaitra	Lv, Fl, Ap	Decoction, infusion, cru, powder	Orally	Cold problem, digestive disease	361	0.318	0.601	2.25	0.166	83.10	
Lavandula officinalis L. (2018Bou/Lo05212)	Lakhzama	Lv, Ap	Decoction Infusion	Orally Rinsing Massage	Cold problem, burn treatment, digestive disease, sedative, kidney disease rheumatological disease, haircare	208	0.196	0.346	2.75	0.072	96.15	
Lavandula stoechas L. (2018Bou/Ls05312)	Lhalhal	Lv, Fl, Ap	Decoction Powder Infusion	Orally Rinsing	Digestive disease, burn treatment	346	0.500	0.576	1.125	0.19	86.99	
Marrubium vulgare L. (2018Bou/Mv05412)	Meriwa	Lv, Ap, St	Decoction Infusion	Orally	Cancer, diabetes, mouth disease	250	0.333	0.416	1.375	0.071	80	
Mentha pulegium L. (2018Bou/Mp05512)	Flayou	Lv, Ap, St	Decoction Infusion Powder	Orally Massage	Respiratory disease, cough, face care	289	0.501	0.481	2.25	0.913	95.15	
Mentha rotundifolia Muds. (2018Bou/Mr05612)	Marseta, Mchachtro	Lv, Ap, St	Decoction Infusion	Orally	Respiratory disease, genito-urinary disease	274	0.333	0.456	1.25	0.0733	98.88	
Mentha viridis L. (2018Bou/Mv05712)	Naanaa	Lv, Ap, St	Essential oil Infusion	Massage	Skin disease, digestive disease	180	0.458	0.3	1.375	0.031	97.22	
Ocimum basilicum L. (2018Bou/Ob05812)	Lhbak	Lv, Sd, Ap	Put in a pot	Externally	Insect control	110	0.450	0.183	1.125	0.0111	100	
Lauraceae												**22.25**
Laurus nobilis L. (2018Bou/Ln05912)	Awrak Sidna Moussa	Lv	Decoction Cooked	Orally Gagarism	Digestive disease, rheumatological disease, mouth disease	120	0.296	0.2	1.375	0.014	92.50	
Cinnamomum verum Berchtold & J. S. Presl (2018Bou/OCv06012)	Qarfa	Pl, St	Powder Decoction Infusion Maceration	Orally	Diabetes, digestive disease	147	0.183	0.245	1.25	0.02	80.45	
Liliaceae												**14.37**
Allium cepa L. (2018Bou/Ac06112)	El-bassla	Bl	Cru Powder	Orally	Cancer	130	0.185	0.216	1.125	0.015	100	
Allium sativum L. (2018Bou/As06212)	El touma	Bl	Cooked Cru	Orally Brushing	Hypertension, haircare	110	0.233	0.183	2.125	0.02	96.36	
Charybdis maritima (L.) Speta. (2018Bou/Cm06312)	El basiila	Bl	Cru Cooked Cataplasm	Brushing	Skin disease	20	0.216	0.033	1.125	0.0003	100	
Linum usitatissimum L. (2018Bou/Lu06412)	Zarriat lkettan	Sd	Powder Infusion	Orally Rinsing	Digestive disease, allergy, appetite stimulation, haircare	85	0.176	0.141	2.375	0.0115	94.11	

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			Maceration								
Lythraceae											**1.66**
Lawsonia inermis L. (2018Bou/Li06512)	El-henna	Lv	Powder Cataplasm Infusion Maceration	Orally Externally	Cancer, digestive disease, antifungal, haircare	10	0.016	0.016	2.375	0.00005	60	
Malvaceae											**1.33**
Malva sylvestris L. (2018Bou/Ms06612)	Khobeyza	Lv, Rt	Decoction Infection Cooked	Orally	Digestive disease, respiratory disease, genito-urinary disease	8	0.033	0.013	1.125	0.0665	75	
Moraceae											**16.66**
Ficus carica L. (2018Bou/Fc06712)	El karmoss	Lv, Fr	Fresh and dry food	Orally	Digestive disease	100	0.133	0.166	1.75	0.0077	100	
Myrtaceae											**34.11**
Syzygium aromaticum **(L.)** *Merr. & Perry* (2018Bou/Sa06812)	Qronfel	Fl	Powder Infusion Maceration	Orally Gagarism	Cold problem, rheumatological disease, sedative, anti-inflammatory, genito-urinary disease, mouth disease	90	0.010	0.15	2.25	0.058	96.66	
Myrtus communis L. (2018Bou/Mc06912)	Rihan	Lv	Decoction Infusion	Orally	Sedative, digestive disease, haircare	204	0.010	0.34	1.25	0.095	98.03	
Eucalyptus ssp. (2018Bou/Es07012)	El-kalibtouse	Lv	Decoction Fumigation	Orally Inhalation	Respiratory disease, diabetes	320	0.166	0.533	1.25	0.0024	99.68	
Oleaceae											**9.16**
Olea europaea L. var. sativa. (2018Bou/Oe07112)	El-ziton	Lv, Fr	Infusion Decoction	Orally Rinsing Gagarism	Diabetes, mouth disease	40	0.145	0,066	1.25	0.0020	90	
Olea europaea L. var. oleaster. (2018Bou/Oe07212)	El-barri	Lv, Fr	Infusion Decoction	Orally Rinsing Gagarism	Diabetes, mouth disease	70	0.333	0.116	1.25	0.005	97.70	
Papaveraceae											**14.5**
Papaver rhoeas L. (2018Bou/Pr07312)	Balaaman	Fl, St	Infusion Cooked Decoction	Orally	Cold problem, antimicrobial	87	0.531	0.145	1.25	0.0071	97.70	
Poaceae											**4.33**
Setaria pallide-fusca (2018Bou/Sp07412)	Ilan	Sd	Powder Infusion Maceration	Orally	Strengthening bones	49	0.081	0.081	1.125	0.0021	100	
Hordeum vulgare L. (2018Bou/Hv07512)	Chaair	Fr, Sd	Powder Cooked	Orally Externally	Skin disease, face care, digestive disease	23	0.060	0.038	2.25	0.0005	86.95	
Cynodon dactylon (L.) Pers. (2018Bou/Cd07612)	Najm	Lv, Ap, Rt	Decoction	Orally	Diabetes	6	0.113	0.01	1.125	0.00003	100	

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Polygonaceae											**3.66**
Emex spinosa (L.) Campd. (2018Bou/Es07712)	Hommayda	Lv, St	Decoction	Orally	Diabetes	22	0.141	0.036	1.125	0.043	100	
Punicaceae											**9.5**
Punica granatum L. (2018Bou/Pg07812)	Raman	Fruits Peels	Powder Infusion Maceration	Orally Externally Gagarism Rinsing	Digestive disease, mouth disease, haircare	57	0.081	0.095	2.25	0.0008	87.71	
Ranunculaceae											**17**
Nigella sativa L. (2018Bou/Ns07912)	Haba ssawda	Sd	Powder Essential oil	Orally	Toxicity, diabetes, kidney disease, allergy, appetite stimulation, cold problem, cardiovascular disease	102	0.033	0.17	1.875	0.0275	83.33	
Rhamnaceae											**34.83**
Ziziphus lotus (L.) Lam. (2018Bou/Zl08012)	Sadra	Lv, Rt	Powder Infusion	Orally Externally	Kidney disease, digestive disease, diabetes, haircare, antimicrobial	209	0.01	0.348	2.5	0.06	95.69	
Rosaceae											**19.38**
Prunus amygdalus stokes var. amara L. (2018Bou/Pa08112)	Louze lmor	Fr, Sd	Food Essential oil	Massage	Skin disease	117	0.036	0.195	1.125	0.0126	100	
Rosa centifolia L. (2018Bou/Rc08212)	Lward	Fl	Decoction Infusion Maceration	Orally Externally	Digestive disease, cold problem sedative, haircare, face care, fever	202	0.083	0.336	2.5	0.106	94.05	
Crataegus monogyna Jacq. (2018Bou/Cm08312)	Admam	Lv, Fr	Decoction	Orally	Cardiovascular disease, digestive disease	30	0.166	0.05	1.25	0.0008	96.66	
Rutaceae											**17.16**
Citrus aurantium L. (2018Bou/Ca08412)	Laronj	Lv, Fr	Cru Juice	Orally	Food conservation, diabetes	97	0.333	0.161	2.125	0.015	92.78	
Citrus limon (L.) Burm. F (2018Bou/Cl08512)	Limoun	Fl, Fr	Cru Juice	Orally	Respiratory disease, skin disease	109	0.195	0.181	1.25	0.015	91.74	
Salicaceae											**4.5**
Populus alba L. (2018Bou/Pa08612)	Safsaf	Lv	Decoction	Orally	Digestive disease	27	0.316	0.045	1.125	0.0006	100	
Sapotaceae											**19.5**
Argania spinosa (L.) Skeels. (2018Bou/As08712)	Argan	Lv, Sd	Essential oil	Orally Massage	Allergy, face care, cardiovascular disease	117	0.048	0.195	2.25	0.0128	85.47	
Theaceae											**14.83**

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Camellia sinensis (L.) Kuntze (2018Bou/Cs08812)	Atay	Lv	Decoction Infusion Maceration	Orally	Metabolic disease, digestive disease	89	0.150	0.148	1.25	0.008	97.75	
Thymelaeaceae												**38.16**
Daphne gnidium L. (2018Bou/Dg08912)	Lazzaz	Lv, Fr	Powder	Externally	Toxicity, haircare	229	0.166	0.381	2.125	0.048	99.56	
Urticaceae												**40.1**
Urtica dioica L. (2018Bou/Ud09012)	Horriqa	Lv	Decoction Infusion	Orally	Cancer, respiratory disease, kidney disease, allergy, diabetes	241	0.045	0.401	1.625	0.048	84.23	
Verbenaceae												**20.16**
Aloysia citriodora Palau. (2018Bou/Ac09112)	Lwiza	Lv	Infusion	Orally	Digestive disease, cold problem, sedative, hypertension	121	0.166	0.201	1.5	0.018	85.12	
Euphorbiaceae												**21.16**
Vitex agnus-castus L. (2018Bou/Va09212)	Kharwaa	Lv	Essential oil	Externally Brushing	Haircare, face care	127	0.145	0.211	1.00	0.059	98.42	
Vitaceae												**0.5**
Vitis vinifera L. (2018Bou/Vv09312)	Dalya	Lv, Fr	Powder Cooked	Externally Brushing	Skin disease	3	0.380	0.005	1.125	0.00008	100	
Zingiberaceae												**35**
Curcuma longa (2018Bou/Cl09412)	Kharkoum	Rt	Powder Infusion Maceration	Orally Externally Brushing	Face care, cancer	204	0.338	0.34	2.125	0.0385	98.03	
Zingiber officinale Roscoe (2018Bou/Zo09512)	Zanjabil	Rt	Powder Cru	Orally	Diabetes, respiratory disease, hypertension	216	0.171	0.36	1.375	0.043	99.07	
Zygophyllaceae												**30**
Peganum harmala L. (2018Bou/Ph09612)	Harmel	Sd	Powder Fumigation	Orally Externally	Toxicity, haircare, sedative, neurological disease, rheumatological disease	180	0.208	0.3	2.5	0.03	94.44	
Asteraceae												**20.88**
Centaurea chamaer (2018Bou/Cc09712)	Tafgha	Rt	Decoction Infusion Cooked Cru	Orally	Digestive disease, liver disease	59	0.005	0.098	1.25	0.003	96.61	
Atractylis gummifera (2018Bou/Ag09812)	Addad	Rt	Powder	Externally	Skin disease	180	0.333	0.3	1.125	0.029	100	
Scolymus hispanicus (2018Bou/Osh09912)	Quernina	St	Cru Cooked	Externally	Skin disease	137	0.356	0.228	1.125	0.0137	100	
Asparagaceae												**20.88**
Argyranthemum frutescens (2018Bou/Af10012)	Chajarat Maryam	Lv	Decoction Infusion	Orally	Genito-urinary disease	90	0.283	0.15	1.125	0.007	100	

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Asparagus officinalis (2018Bou/Ao10112)	Seckoum	Rt	Infusion	Orally	Diabetes	108	0.095	0.18	1.125	0.010	100	
Caralluma europeae (2018Bou/Ce10212)	Deghmous	Ap	Powder Juice	Orally	Toxicity, diabetes, liver disease, cancer, cysts	206	0.3	0.34	1.625	0.115	96.22	
Molluginaceae												**20.83**
Corrigiola telephiifolia (2018Bou/Ct10312)	Sarghina	Rt	Decoction Cru	Orally Externally	Headaches, digestive disorders	125	0.228	0.208	1.125	0.017	96	
Pinaceae												**2**
Pinus pinaster Aiton. (2018Bou/Pp10412)	Tayda	Fr, Pl	Powder	Externally	Skin disease	12	0.15	0.02	1.125	0.001	100	
Xanthorrhoeaceae												**13**
Asphodelus microcarpus (2018Bou/Am10512)	Berwag	Rt	Decoction Powder Infusion	Externally Orally	Skin disease, digestive disorders, respiratory disease	78	0.18	0.13	1.375	0.006	97.43	

Part used: Lv: Leaves; Bl: Bulb; Pl: Peels; Fl: Flowers; Fr: Fruit; Sd: Seeds; Ap: Aerial part; Wp: Whole plant; Rt: Root; Rz: Rhizome; St: Stem

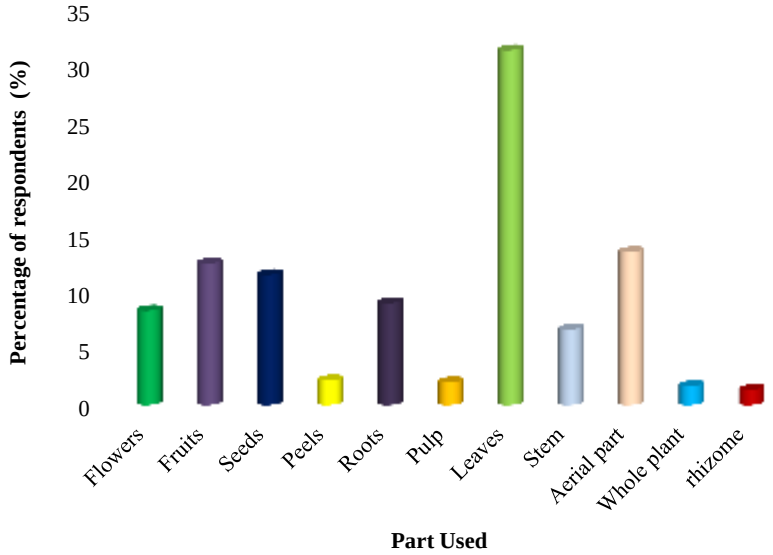

Figure 5: Used part of plants by the participants

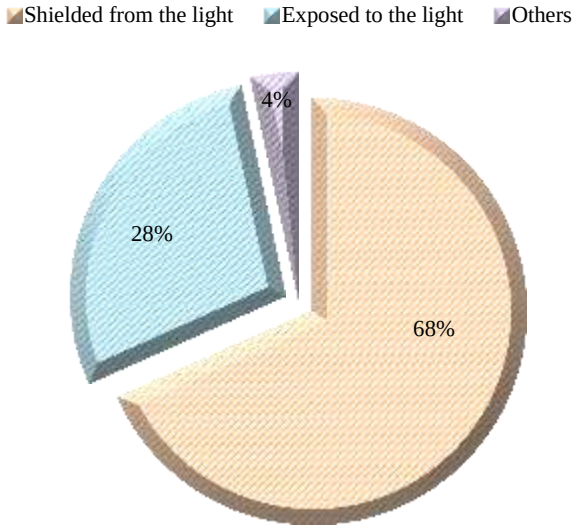

Figure 6: Conservation methods used by the participants

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Table 4: Informant consensus factor

Treated diseases	Number of users treated by the species	Percentage of number of users treated by the species	Number of species used
Skin affection	1153	6.452	21
Cardiovascular disease	61	0.341	7
Haircare	1108	6.200	18
Intestinal disorder	103	0.576	2
Diabetes	1631	9.127	23
Appetite stimulation	107	0.598	4
Rheumatological disease	383	2.143	7
Mouth disease	698	3.906	12
Fever	228	1.275	3
Digestive disease	3517	19.682	47
Cancer	746	4.174	10
Hearing impairment	80	0.447	1
Stomach pain	252	1.410	2
Cold problem	826	4.622	18
Lung disease	80	0.447	3
kidney affectation	995	5.568	16
Cough	590	3.301	3
Hypertension	365	2.042	6
Metabolic disorder	18	0.100	2
Facial care	822	4.600	9
Neurological	9	0.050	3
Toxic	27	0.151	7
Anti-inflammatory	147	0.822	4
Liver disease	53	0.296	4
Allergy	276	1.544	6
Sedative	817	4.572	12
Respiratory	1775	9.933	13
Eye disease	6	0.033	2
Obesity	6	0.033	2
Headache	51	0.285	2
Burn treatment	320	1.790	3
Sleep disorder	20	0.111	1
Insect bite	2	0.011	1
Food intoxication	2	0.011	1
Cyst	207	1.158	2
Antibacterial	5	0.027	1
Weight gain	115	0.643	1
Virtue	3	0.016	1
Asthma	2	0.011	1
Blood circulation	4	0.022	1
Antimostics	110	0.615	1
Antifungal	2	0.011	1
Antimicrobial	8	0.044	2
Strengthening of bones	49	0.274	1
Food preservation	90	0.503	1

Other studies[20,21] also reported the same results, particularly with regard to the preponderance of the oral administration method.

The obtained results and the harmful effects of medicinal plants

48% of the survey participants believe that medicinal plants improve their health, while 36% believe in the healing power of these plants. 11% expected that these plants do not cause any desirable effects. The rest (5%) noticed some minor problems (Figure 9). The current findings are similar to those of Benkhnigue et al.[4] Most herbal medicines are known to have side effects, indeed 63% of distributers said precautions should be taken when using them, while 37% said that herbal medicines are toxic (Figure 10).

Data analysis

Use value (UV) and relative frequency of citation (RFC)

In this current survey, *Origanum compactum* is the most used species in the study area, it recorded the highest UV (0.60) and RFC (0.61), *Satureja calamintha* is another notable species as it registered the second-highest UV (0.50) and RFC (0.64), the third species is *Thymus zygis* with UV (0.50) and RFC (0.60), while the fourth species is *Lavandula stoechas* with UV (0.50) and RFC (0.57). The present results obtained show that the most used families to treat diseases in the study area are Lamiaceae (FIV=41.37%), Apiaceae (FIV=10.76%), Fabaceae (FIV=19.42%), and Asteraceae (FIV=16.36%). The four families are most represented in other ethnobotanical studies.[22,27,30,32] Likewise, the leaves are the most used part with PPV=0.313.

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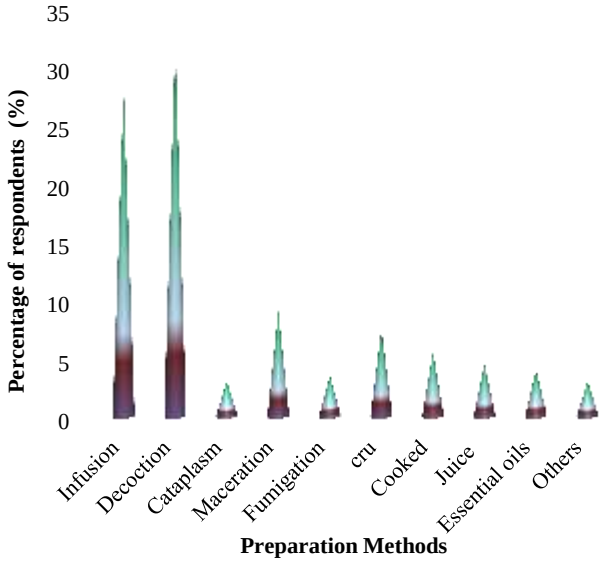

Figure 7: Preparation method of medicinal plants used by the participants.

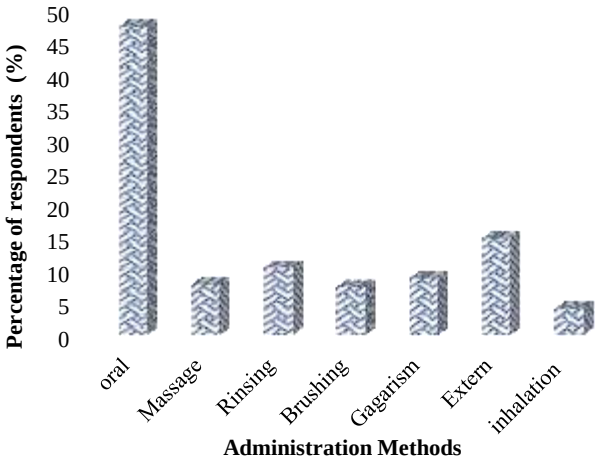

Figure 8: Administration method used by the participants.

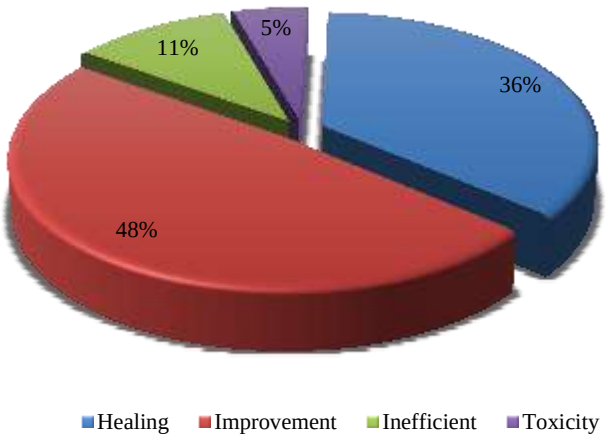

Figure 9: Benefits of medicinal plants used by the participants.

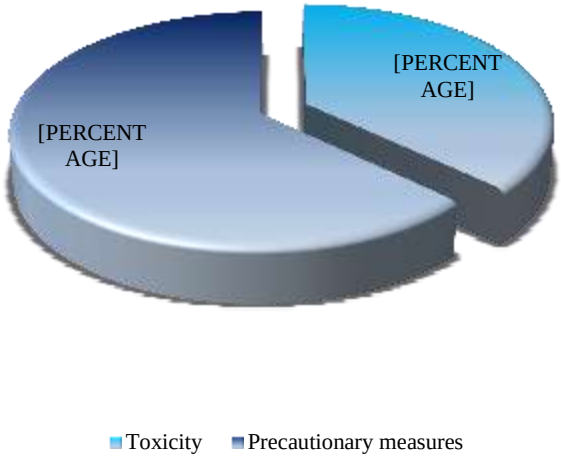

Figure 10: The harmful effects of herbal medicine used by the participants

The aerial part comes second with VPP=0.135, followed by fruits (VPP=0.125), seeds (VPP=0.115), roots (VPP=0.090), flowers (VPP=0.083), stems (VPP=0.066), peels (VPP=0.021), whole plant (VPP=0.016), bulb (VPP=0.013), and rhizome (VPP=0.013). These results are similar to other studies, especially the following studies.[26,30,31]

Fidelity level (FL)

The results regarding the fidelity level are illustrated in table 3, which shows that the plants with the highest FL values (100%) were the following: *Pistacia lentiscus, Conyza canadensis, Cynara scolymus, Brassica rapa, Herniaria hirsute, Saponaria officinalis, Chenopodium ambrosioides, Cicer arietinum, Vicia ervilia, Retama raetam, Centaurium erythraea, Ocimum basilicum, Allium cepa, Charybdis maritima, Ficus carica, Setaria pallide-fusca, Cynodon dactylon, Emex spinosa, Prunus amygdalus, Populus alba, Vitis vinifera, Atractylis gummifera, Scolymus hispanicus, Argyranthemum, Asparagus officinalis and Pinus pinaster*. Similar results were obtained in the other ethnobotanical surveys where the number of plants with an FL of 100% was higher.[32,41,42]

Conclusion

The current ethnobotanical survey performed in the commune of Bouchfaa, province of Taza, North-eastern Morocco, provided data related to the use of medicinal plants to treat diseases. The survey results show that the indigenous people mainly use medicinal plants to treat themselves. It should firstly be noted that there is a significance between the frequency of use of plants and the profile of the people interviewed. Medicinal plants are more likely to be used by people aged between 35 and 55 and women. Through this survey, recommendations are made to valorize the medicinal plants of the studied region and to preserve the plant biodiversity of the region.

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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