Ethnobotanical Study of the Most Lamiaceae Used as Medicinal and Culinary Plants by the Population of Bejaia Province, Algeria

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ABSTRACT

This study was carried out to safeguard ancestral knowledge about most Lamiaceae plants used by the population of the Bejaia region (north-eastern Algeria) for medicinal and food purposes. Using 200 questionnaire sheets, ethnobotanical surveys were performed between February and July 2020. The data were analyzed by calculating quantitative indices such as Relative Citation Frequency (RFC), Plant Part Value (PPV) use index, and Fidelity Level (FL). It was shown that women hold ethnobotanical information (52%) more than men (48%), older persons are expected to provide more reliable information and the majority of users have a university level. Otherwise, herbal medicine is used more in rural areas than in urban and 55% of the studied plants are cultivated while 45% are wild. The leaves are the most used part (PPV = 0.592) and the infusion method was the most commonly used (69.7%). Ethnobotanical analysis revealed that *Mentha spicata* L. (RFC=0.44), *Lavendula stoechas* L. (RFC=0.215), and *Salvia officinalis* L. (RFC=0.205) are frequently used. Digestive pathologies are the major therapeutic indications and 41.44% of species were used for seasoning meat and fish. This survey could constitute an important source of information and a database for further research in the fields of phytochemistry and pharmacology.

Keywords: Ethnobotany, Bejaia, medicinal plants, Lamiaceae, therapeutic effects, culinary uses.

Introduction

Various plants were employed by the population since ancient times for their medical and food needs. [1] Nowadays, medicinal plants still play a major role in the treatment of several pathologies, especially in rural areas for financial causes and owing to inconvenience in accession to sanitary concerns. [2, 3]

Ethnopharmacological studies and ethnobotanical surveys constitute a very reliable approach to the exploration of ancestral information and are efficient techniques for determining and documenting medicinal plants. [4] These last have constantly been a substantial constituent of the ancestral method of cure in developing nations, and have also been a basic section of the folklore and cultural customs of regional societies. [5, 6]

In some African nations, equivalent to 90% of the inhabitants depends uniquely on wild herbals as the origins of medications. Furthermore, renewed attention concerning medicinal and food plant research and their ancestral application by various indigenous populations of Africa were noted in actual years. [7]

Algeria is known for its floristic diversity which constitutes a rich phylogenetic source with about 3000

species belonging to several botanical families. [8, 9] The Kabylie region is characterized by high biodiversity which affords Algeria to hold a prominent position amongst the North African nations, with a large medicinal heritage. [10-12] The use of medicinal plants takes a substantial location in the practices of treatment in Algeria, and the Kabylie location is a factual example.

Despite conventional remedies being acknowledged as prominent to preserve the health of 70-80% of the African population, quite a few comparative works have been achieved on the usage of medicinal plants by several civilizations or ethnic groups in the African continent. The main research works on herbal medicines have been realized in the advanced world. [7] On the other hand, an investigation of the Algerian medicinal literature demonstrates that the information on local medicinal species is incomplete and scattered. It is therefore essential to undertake such investigations to identify the uses by the population of medicinal plants. In addition, because of the excessive cost of drugs, and low income, plants constitute an important source for the population.

Even though the previous study was conducted on some Algerian native plants, there are no documented records of species employed as culinary herbs. In addition, to our knowledge, only one work is devoted solely to the study of three species was carried out in the region of petite Kabylie (Bejaia). [12] So, this survey aims to study and register the ancestral information and usage of plant species for gastronomic aims and their therapeutic prominence for humans in the Bejaia region.

The current study focuses on the achievement of a survey of the main plants belonging to the Lamiaceae family with the inhabitants of the Bejaia Departement (petite Kabylie). This will make it possible to have a collection relating to the ancestral use of these medicinal and food herbs. It is awaited that this research study will emphasize a few prospective herbs for probable huge extent productivity for both culinary and medicinal purposes about the economical rising of the population.

Material and Methods
Plants material

Twelve plants of the Lamiaceae family are selected, namely: horehound (*Ballota nigra* L.), basil (*Ocimum basilicum* L.), lavender (*Lavendula stoechas* L.), apple mint (*Mentha rotundifolia* L.), pennyroyal (*Mentha pulegium* L.), spearmint (*Mentha spicata* L.), lemon balm (*Melissa officinalis* L.), oregano (*Origanum vulgare* L.), brunelle (*Prunella vulgaris* L.), rosemary (*Rosmarinus officinalis* L.), sage (*Salvia officinalis* L.), and thyme (*Thymus vulgaris* L.). These plants were selected based on their dual culinary and medicinal uses by the inhabitants of the study region (Bejaia), as well as for their availability in all the studied areas.

Description of the study area

This ethnobotanical survey was carried out in the department of Bejaia (petite Kabylie) (**Figure 1**) which is one of the largest coastal regions of Algeria. The total population of this region is estimated at 978,050 inhabitants in the census of December 2018 in an area of 3261 Km^2.
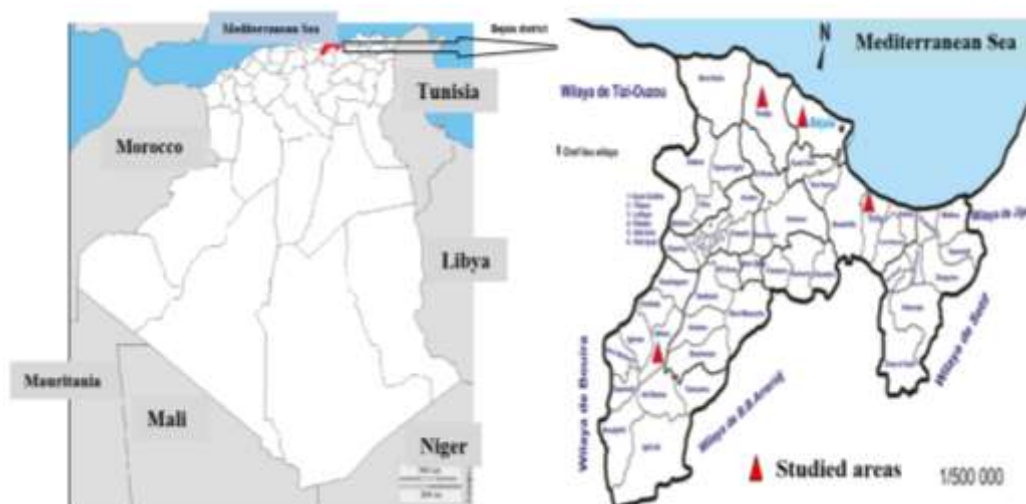
Figure 1. Map of the study areas.

Data collection

To assemble information related to the uses of the selected plants, ethnobotanical surveys were achieved during a period from February to July 2020 in different localities of Bejaia province (Algeria). The characteristics of the different sites were summarized in **Table 1**.

The area was divided into five layers (strata) (S1, S2, S3, S4, and S5) (**Figure 1**), samples of 40 persons constituted each of the 5 strata are arranged jointly to represent 200 informants.

The interviews with the informants were conducted in the Kabyle dialect of the region.

Identification and conservation of plant species

The harvested specimens were identified employing the following book: New flora of Algeria and southern desert regions.[9]

The regional name and the botanical and ethnobotanical features of the studied herbs were written on the specimens placed in the Laboratory of 3BS, Department of Food Sciences, Faculty of Natural Sciences and Life, Bejaia (Algeria).

Data Analysis

Descriptive statistical techniques using Microsoft Excel 2007 allowed the determination of frequencies and percentages which were employed to explore the socio-demographic information of informers.

Examination of ethnobotanical information was performed by the RFC, the PPV use index, the FL, and the Informant Consensus Factor (ICF) as reported by Orch et al. [2] and Sukumaran et al. [5]

Table 1.Characteristics of the different study areas.

Study sites	Geographical coordinates	Altitude (m)	Area(km²)	Average precipitation (mm)	Avearge T (°C)	Climate	Number of inhabitants
Akbou	Latitude : 36.45, Longitude : 4.55° 27′ 0″ N, 4° 33′ 0″ E	Minimal:180 Maximal: 400 Average : 290	52.2	358.6	26.2	Mediterranean with dry summer	190 766
Toudja	Latitude : 36.76, Longitude : 4.89°45′31″ N, 4°53′36″ E	Minimal : 252 Maximal:1317 Average : 785	16713	672	19	A warm Mediterranean climate with dry summer	10 534

Study sites	Geographical coordinates	Altitude (m)	Area(km²)	Average precipitation (mm)	Avearge T (°C)	Climate	Number of inhabitants
Tichy	Latitude: 36.6675, Longitude : 5.1600936° 40′ 3″ N, 5° 9′ 36″ E	Minimal : 0 Maximal : 435 Average : 22	56.7	600	15.8	Mediterranean with hot summer	16 546
Bejaia city	Latitude : 36.75, Longitude : 5.07 36° 45′ 0″ N, 5° 4′ 0″ E	Minimal : 1 Maximal : 660 Average : 331	120.2	739	22.2	Warm and temperate Mediterranean climate	190 766
Tazmalt	Latitude : 36.39, Longitude : 4.39° 23′ 4″ N, 4° 23′ 57″ E	Minimal : 100 Maximal : 100 Average : 100	33.6	672.3	27.5	Mediterranean with dry summer	30 968

Relative frequency of citation (RFC) $(0 < RFC < 1)$ is determined to evaluate the regional relevance of each plant and is estimated as follows :

$RFC = Fc/N$

Fc: citation frequency

N: number of respondents

Plant Part Value (PPV)

The PPV is measured to estimate the relevance of each employed part of the species by the responders, it is calculated as follows :

$PPV = RUplant\ part/RU$

with RUplant part is the sum of reported uses per part of the plant.

RU= the number of reported uses of all parts of the plant.

Fidelity level (FL)

To calculate the most frequently employed plant for treating a specific illness type by the informers of the Bejaia zone, the fidelity level (FL) was determined as follows:

$FL = Np/N \times 100$

with Np is the number of use-reports cited for a specific plant for a distinct disease type and N is the total number of usage statements mentioned for any afforded species.

Informant consensus factor (ICF)

ICF was calculated for each category of ailments to identify the agreements of the informants on the reported cures for the group of ailments. It corresponds to the number of use citations in each category (n_{ur}) minus the number of species used (n_t), divided by the number of use citations in each category minus one :

$ICF = n_{ur} - n_t/ n_{ur} - 1$

Results and discussion

Sociodemographic profile of the respondents

During the ethnobotanical survey carried out in the five chosen strata (**Table 2**), we found that both genders (men and women) are interested in traditional medicine with little benefit going to women (52%) (**Table 3**). Commonly women are more concerned with herbal treatment and the preparation of recipes based on medicinal plants. In Algeria, in general, and in the wilaya of Bejaia in particular, it is the women who cook and use medicinal plants more to heal their families.

Table 2. Distribution of the surveys by strata.

Strata	Names of Strata	Number of Inquiries
Strata 1	Akbou (Chellata, Ighrem)	40
Strata 2	Toudja (Tala hiba, Ifrene)	40
Strata 3	Tichy (Tizi Ahmed, Lemaâden)	40
Strata 4	Bejaia city (Centre-ville, Ihaddaden)	40
Strata 5	Tazmalt (Laâzib, Aït Lhadj)	40
Total respondents		**200**

These results are consistent with those found in other ethnobotanical works performed in different provinces of Algeria. [10, 12-14] Likewise, in other countries, several studies have found that women hold ethnobotanical information more than men. [2, 15-17]

This is probably because women are traditionally the custodians of the secrets of medicinal plants. [15] It is also well known that the women take care of the preparation of the recipes for their care and those of their children. [16]

The utilization of the species chosen in this survey interests different age categories of the study areas. According to the results, the old people where those over 60 years constitute 25% followed by the age groups of [41-60], <20, [31- 40], and [20-30] with 22.5%, 21%, 18.5%, and 13%, respectively. The elderly informants are the better connoisseurs in the field of phytotherapy since they have a long experience accumulated and transmitted from one generation to another. We also noted that young people, including those under the age of 20, are interested in herbal medicine and this can be explained by the fact that they consult the Internet to adopt traditional remedies. Similar results have been obtained by several other studies at a national scale. [10, 18]

We remarked that the surveyed people with different levels are interested in traditional medicine. Most of the participants have a university level (27.5%), followed by those with a secondary level (25%), and middle school (21%). Nonetheless, a low percentage was attributed to people with primary education (1.5%). Meanwhile, the percentage of illiterate people is not negligible (25%) **(Table 3)**. These results showed that it is not only illiterate people who are interested in herbal medicine but also educated people.

Table 3. Socio-demographic characteristics of the participants in the study area.

	Distribution	Number of informants	Percentages (%)
Gender	Male	96	48
	Female	104	52
Age groups	<20	42	21
	[20-30]	26	13
	[31-40]	37	18.5
	[41-60]	45	22.5
	>60	50	25
Educational level	Illiterate	50	25
	Primary	3	1.5
	Middle	42	21
	Secondary	50	25
	University	55	27.5
Habitat	Town	40	20
	Village	160	80

Our results are consistent with those achieved by Zahir, Elazaoui, Chakouri and Naouer [19] in Beni Mellal - Khénifra region (Morocco) who found that 18.09% of herbal medicine users are illiterate, while 81.91% correspond to different educational levels.

As regards the living environment of the people questioned, those who live in rural areas tend to use herbal medicine with a percentage of 80%. Zahir, Elazaoui, Chakouri and Naouer [19] demonstrated similar results in the Beni Mellal-Khénifra region of Morocco where most of the respondents come from the villages and mountains since rural participants are the main consumers of medicinal plants. This may be justified by the fact that the rural population maintains good contact with nature. Besides, most of the inhabitants of rural areas have a low income which does not allow them to seek medical help and/ or buy medicines which leave them in

front of herbal medicine as a cheaper remedy. [19]

Relative Frequency of Citation

The number of citations of the studied species in the different study areas varies from 14 to 88 times. The most cited species was *Mentha spicata* L. with an RFC of 0.44, followed by *Lavendula steochas* L. (RFC = 0.215), *Salvia officinalis* L. (RFC=0.205), *Thymus vulgaris* L. (RFC=0.2), *Origanum vulgare* L. (RFC= 0.195), *Mentha pulegium* L. (RFC=0.175), *Ocimum basilicum* L. (RFC= 0.17), *Ballota nigra* L. (RFC =0.14), *Melissa officinalis* L. as well as *Prunella vulgaris* L. (RFC= 0.135), then *Rosmarinus officinalis* (RFC= 0.09), and finally *Mentha rotundifolia* L. (RFC= 0.055) **(Table 4)**.

Table 4. List of the studied plants from the Lamiceae family in the study area.

Scientific name	Local name	Parts used	Preparation mode	Administration	Fc	RFC
Ballota nigra L.	Amarnouy	Aerial part, leaves	Infusion	Internal	28	0.14
Lavendula stoechas L.	Amezir	Flowering tops, leaves	Infusion, Decoction		43	0.215
Mentha rotundifolia L.	Timejja	Leaves	Infusion, Decoction, Pression	External	14	0.055
Mentha pulegium L.	Flewou	Aerial part, leaves	Infusion, Decoction	Internal	35	0.175
Mentha spicata L.	Nââna	Leaves	Infusion	Internal	88	0.44
Melissa officinalis L.	Ifer t'Zizoua	Leaves	Infusion	Internal	27	0.135
Ocimum basilicum L.	Lehvak	Leaves	Infusion, Pression	Internal External	34	0.17
Origanum vulgare L.	Zaâther	Leaves, tiges	Infusion, Decoction	Internal	39	0.195
Prunella vulgaris L.		Fruits, leaves, tige	Pression, Decoction	Internal	39	0.195
Rosmarinus officinalis L.	Amezir Ouamen	Leaves, flowers	Infusion, Decoction	Internal	18	0.09
Salvia officinalis L.	Agurim, Tazzurt	Leaves, stems	Decoction, Infusion, Pression, Maceration	Internal	41	0.205
Thymus vulgaris L.	Thizaathrin	Aerial part, leaves	Infusion, Decoction	Internal	40	0.2

M. spicata and *O. basilicum* are widely used as herbal medicine and to season food since they are available throughout the year in both rural and urban regions of Bejaia. The 10 other medicinal species are also cited more than 10 times which implies that they are also used by the inhabitants of the study areas.

Frequency of use of the plants according to their origin

According to the plants' origin, 110 (55%) stated that the majority of the studied species are cultivated and 90 (45%) answered that they were wild while no person (0%) indicated that they were imported. Chehma, Djebar, Hadjaiji and Rouabeh [20] has shown that a rate of 58% of herbal medicine in south-eastern Algeria is wild species.

In connection to the harvest period, the obtained results revealed that 28.4% of respondents stated that the plants studied are perennials whatever the climatic conditions, 43.19% indicated that these medicinal plants are more harvested during the spring period, and 26.47% mentioned that their harvest is done in summer. Conversely, 0.78%, and 1.17% reported that the plants are harvested in autumn and winter, respectively **(Table 5).**

These findings are close to the results of the ethnobotanical study conducted in Ouargla region (northern Sahara in Algeria) where informants denote that 72% of herbal species are collected in spring. [20]

Parts used

With the intent to make curative preparation, several parts (leaves, flowers, fruit, seed...) can be used depending on the plant's nature. The determination of the Plant Part Value (PPV) use index demonstrated that the leaves are the most employed (PPV= 0.592), come then the fruits (PPV= 0.160), the stems (PPV=0.118), the aerial parts (PPV=0.097), the roots (PPV=0.021), and finally the seeds (PPV= 0.010) **(Figure 2)**. This divergence in the proportions of the plant parts exploited can be justified by

the type of plants studied which are aromatic and the volatile oils will be concentrated in the leaves. In addition, this can be explained by the easiness of collecting the leaves. [2] The dominance of the leaves used has been corroborated by other surveys performed in other localities of Algeria. [10, 21, 22]
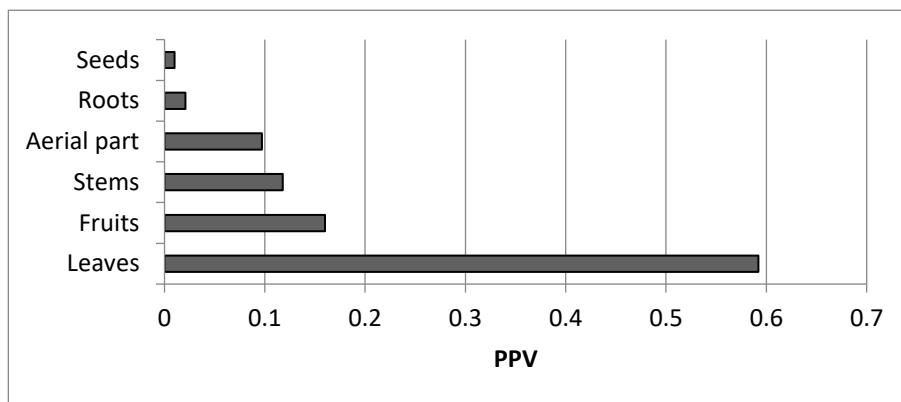

Figure 2. Percentages of different parts used for the treatment of differnt diseases in the zone of study.

Method of preparation and administration

Depending on the preparation method, infusion is the most employed (69.67%) followed by decoction (18.03%), pressing (7.38%), and maceration (4.92%) (**Table 5**). The best preparation method for plants would preserve all of their properties while allowing the extraction and assimilation of the active ingredients. [23]

These results are in agreement with those found by other Algerian researchers [20, 21] who recorded the dominance of the infusion mode with percentages of 50% and 20.45%, respectively.

Various modes were utilized in the administration of herbal preparations. The oral route contributed 77.33% of the total species, followed by an external application (14.67%), and inhalation of smoke (8%) (**Table 5**).

The oral application is popular as to the finding of Benarba [22] and Khaled-Khodja, Brahmi, Madani and Boulekbache-Makhlouf [12] who reported it as the leading route of application used in East (Bejaia), and in South-West Algeria (Saharian regions). It is also in agreement with the result of various ethnobotanical studies conducted elsewhere in Morocco [16, 24] and indicates that the oral way is the predominant route of application.

Table 5. Data related to the plants studied.

	Distribution	Number of informants	Percentages (%)
Plant type	Cultivated	110	55
	Wild	90	45
	Imported	0	0
Harvest period	Perennials	73	28.4
	Spring	111	43.19
	Summer	68	26.47
	Autumn	2	0.78
	Winter	3	1.17
Part used	Leaves	46	16.03
	Stems	34	11.85
	Aerial part	28	9.76
	Roots	6	2.09
	Seeds	3	1.05

	Distribution	Number of informants	Percentages (%)
Preparation mode	Infusion	170	69.67
	Decoction	44	18.03
	Pressing	18	7.38
	Maceration	12	4.92
Administration mode	Orally	174	77.33
	External application	33	14.67
	Inhalation	18	8
Reason for use herbal medicine	Low cost	169	45.43
	Effectiveness	161	43.28
	Better than conventional drugs	22	5.91

The provenance of knowledge of medicinal plants
Ailments treated by studied plants

Plant medicines are employed for several diseases in Algeria. The studied species are most frequently used to treat affections of the digestive system (78%) and affections of the annex glands of the digestive tract (30%), respiratory disorders (60%), neurological disturbances (39.5%), dermatological affections (13%), genitourinary disorders (7.5%), and cardiovascular diseases (6.5%). This was also confirmed by the highest ICF value (1.81) attributed to gastrointestinal and related diseases (**Table 6**).

Some species were registered as being employed for more than one ailment. Among the 12 species studied, the highest FL of 64.28% was noticed for *Mentha rotundifolia*, followed by *Prunella vulgaris* L. (48.14%), and *Ballota nigra* L. (46.42%). *Rosmarinus officinalis* L., *Melissa officinalis* L. and *Ocimum basilicum* L. have the same FL of almost 44%. On the other hand, 7 of the plants had the lowest FL value of about 20% **(Table 6)**.

Table 6. Distribution of the different therapeutic uses of medicinal plants, Informant Consensus Factor (ICF) and Fidelity Level (FL) values for common medicinal plants used by local traditional healers by ailment category.

Ailment categories	Use citations	%	ICF value	Most preferred species with specific ailment	FL (%)
Dermatological infections/ diseases	26	13	0.96	*Prunella vulgaris* L. (stops bleeding, oral infections)	**48.14**
				Salvia officinalis L. (wounds, mouth, throat, canker sores, palate, gingivitis care)	**24.39**
Gastro-intestinal ailments	156	78	0.95	*Mentha rotundifolia* L. (stomachic, increased appetite)	**64.28**
				Ballota nigra L. (digestive, anti-vomiting, anti-diarrhea)	**46.42**
				Rosmarinus officinalis L. (anti-diarrhea, liver, vesicles care)	**44.44**
Affections of the annex glands of the digestive tract	60	30	0.86	*Melissa officinalis* L. (vomiting during pregnancy, promotes bile secretion, promotes digestion)	**44.44**
				Ocimum basilicum L. (nausea, vomiting)	**44.11**
				Origanum vulgare L. (digestive problems, improves appetite)	**33.33**
				Salvia officinalis L. (diarrhea and ulcer)	**31.70**
				Thymus vulgaris L. (gastroenteritis, stimulates digestion)	**22.5**
				Mentha spicata L. (carminative, stomachic, abdominal pain, appetizer, nausea, vomiting)	**20.45**
Respiratory system diseases	120	60	0.95	*Origanum vulgare* L. (respiratory, cold)	**46.15**
				Thymus vulgaris L. (asthma, bronchitis, cold, flu)	**37.5**
				Prunella vulgaris L. (cold, lung care)	**37.03**
				Mentha spicata L. (cold, flu)	**36.36**
				Mentha pulegium L. (respiratory problems)	**34.28**
				Lavendula stoechas L. (release the respiratory tracts, respiratory expectorant, respiratory system infections)	**30.23**
				Salvia officinalis L. (calm the smoker's cough)	**26.82**
Circulatory system/ cardiovascular diseases	13	6.5	1	*Ocimum basilicum* L.	**32.35**

Ailment categories	Use citations	%	ICF value	Most preferred species with specific ailment	FL (%)
Genio-urinary ailments	15	7.5	0.86	*Rosmarinus officinalis* L. (fertility, diuretic)	**38.88**
				Thymus vulgaris L. (painful periods, inflammation of the bladder)	**20**
				Salvia officinalis L.(regulates the cycle, painful periods)	
Neurological disorders	79	39.5	0.95	*Melissa officinalis* L. (against anxiety)	**44.44**
				Ballota nigra L. (sedative, sleep inducer, anxiety, nervous disorders)	**39.28**
				Mentha spicata L. (insomnia, calm nerves, headache, against dizziness, relaxing)	**30.68**
				Lavendula stoechas L. (dizziness, migraine, nervous sleep disturbances)	**20.93**
				Rosmarinus officinalis L. (dizziness, migraine, calm anxiety)	**20.90**

Evidently, the remedies for usually indicated sicknesses have the highest FL values and those species less preferable for the treatment of particular sicknesses have low FL values. Plants with high FL might be an evidence of their potency effects on a particular sickness. In this survey, the FL values indicate that the Bejaia population prefers some species from the Lamiaceae family for treating certain diseases.

It is quite clear that the majority of species (9) are used to treat gastrointestinal ailments and affections of the annex glands of the digestive tract. *Mentha rotundifolia* L. with the highest FL value was recommended as stomachic and increased appetite and four species (*Ballota nigra* L., *Melissa officinalis* L., *Ocimum basilicum* L., *Mentha spicata* L.) were used as anti-vomiting. Moreover, four species (*Ballota nigra* L., *Rosmarinus officinalis* L., *Ocimum basilicum* L., *Salvia officinalis* L. were useful as anti-diarrhea.

Many species (8) with high FL values were also indicated in respiratory system diseases mainly *Origanum vulgare* L., *Thymus vulgaris* L., *Prunella vulgaris* L., and *Mentha spicata* L. which were preconised particularly in cold cases. In addition, five species are effective in neurological disturbances mainly *Melissa officinalis* L. which was considered as a remedy for anxiety.

It is well known that many species of the Lamiaceae family are effective in the treatment of gastrointestinal diseases in many countries. The main diseases treated with plants from Algeria based on the results of the European project RUBIA, that research has been achieved on the traditional use and handling of plant species in seven Mediterranean countries (Albania, Algeria, Cyprus, Egypt, Italy, Morocco, and Spain) ; are stomach-ache and the majority of identified Algerian plants are also used as a sedative. [25] The same trend was revealed by Benarba [22] where gastrointestinal illnesses were the most commonly treated pathologies with medicinal plants in southwest Algeria (33.6%), followed by respiratory (23%) and cardiovascular diseases (9%).

The dominance of treatment of digestive disorders by medicinal plants of the Lamiaceae family has been reported in several studies. Indeed, *O. basilicum* as well as *M. spicata* are considered as a natural remedy to treat digestive disorders in the region of Settat (Morocco). [26] Miara et al. [27] confirmed that *L. steochas*, *R. officinalis*, and *M. pulegium* are used to treat stomach aches in the region of Tiaret (Algeria). Additionally, *M. officinalis*, *M. puleguim*, *T. vulgaris,* and *O. vulgare* are exploited by the population of the Talassemtane region (Western Rif of Morocco) to treat digestive ailments. [28] On the other hand, Kemassi et al. [29] stated in their study that *M. rotundifolia* is used in the region of Rabat (Morocco) to treat osteo-articular disorders. As for *S. officinalis*, it is recognized as a remedy for diabetes in the M'Zab valley (northern eastern Algerian Sahara). [30] *M. pulegium* was considered as the most effective species for treating pathologies related to the respiratory system. [25]

Among the species from Kabylie (Tizi-Ouzou department) investigated by Meddour and Meddour-Sahar[11] to heal disturbances of the digestive tract, *B. nigra*, *M. pulegium*, *M. spicata*, *M. rotundifolia*, *O. vulgare* and *L.*

stoechas displayed principal place and are effective in several gastrointestinal disorders (indigestion, constipation, diarrhea, dysentery, stomach ulcer, hyperacidity, vomiting, bloating, intestinal worms).

In the southwest of Algeria, *Thymus vulgaris* L., *Mentha pulegium* L., and *Ocimum basilicum* L. are mostly used in the management of respiratory-related ailments. [22]

Apart from the major indications in table 6, the people questioned indicated that the majority of plants are also used in the form of herbal tea to relieve painful periods (basil, sage, oregano, spearmint, pennyroyal). In addition, it has been indicated that basil is recommended for eye disease (conjunctivitis) and is used in feverish states, fatigue and to reduce fever. Apple mint and oregano are indicated for headaches and as pain relievers and anesthetics. Lavender is used for liver and gallbladder disorders, dizziness, thinness, eczema, psoriasis, acne, nervous sleep disorder and as an antidiabetic. Pennyroyal is recommended for stomach aches, to address fertility problems in women, and to lower cholesterol levels and headaches. The brunelle is used to treat oral infections and sore throats and it is febrifuge. Thyme is used as an antiseptic, against insect bites, and for inflammation of the bladder. Lemon balm is considered an antiviral and can be used for dental pain. Spearmint is investigated as a diuretic, helps to eliminate kidney stones, and relieves stings associated with insect bites. Oregano is

indicated as an insecticide, antiseptic and is used for migraine and toothache. Sage activates circulatory functions and is recommended in cases of physical and intellectual overwork.

Reasons for the use of herbal medicine

In our studies, 45.43% of the interviewees used herbal medicine since they had a low socio-economic level, 43.28% have chosen them for their efficiency and, 5.91% believe that they have fewer side effects than drugs (**Table 5**). These findings coincide with those found in most ethnobotanical studies made in neighboring countries like Morocco. [2, 31]

Various plants are used for their therapeutic properties by populations around the world, following historical, cultural, and economic considerations. The conventional health system remains very expensive for several populations in the world. In addition, phytotherapy treatment is one of the scarce therapeutic tools allowing a symptomatic and truly etiological approach to be taken. [1, 2]

Culinary uses

We report that the majority of respondents (92 responses out of 222) indicated that the studied species were used for seasoning and flavouring meat and fish; this can be explained by the fact that the plants chosen are mainly aromatics. They were employed also to season pasta, herbal teas, soups, sauces, and salads with percentages of 22.52, 15.77, 13.06 f, 14, 6.31, and 0.9%, respectively (**Figure 3).**
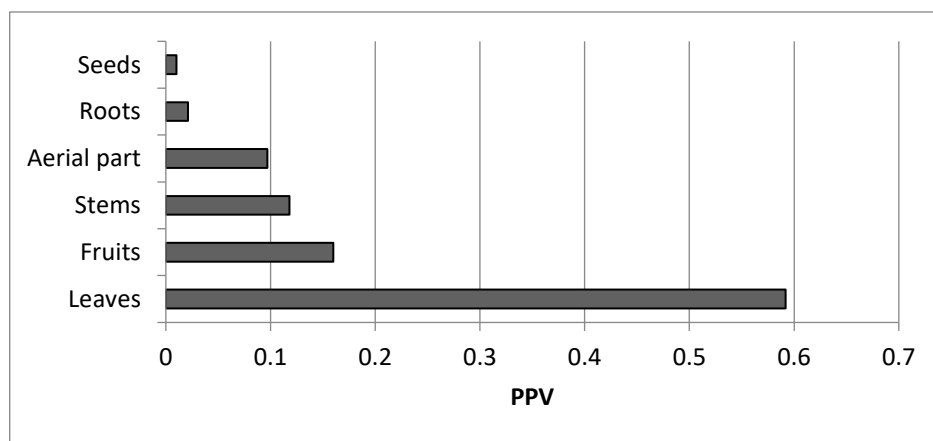

Figure 3. Culinary use of the studied plants.

According to Derridj, Ghemouri, Meddour and Meddour-Sahar [10] not less than 42 species (34.21% of the total plants) from Kabylie (Tizi-Ouzou Department) have food applications. They are used to prepare some very famous dishes in the region of Kabylie such as wild tea (Letaï lekhla), spice bread (Aghrum lehwal), steamed dishes (Aâmouch), and special pasta with vegetables (Avazine).

D'Antuono and Elementi [32] reported that herbs from the Lamiaceae family possess the main properties of spices, including antioxidant and antimicrobial, and are used as a food flavoring and as a preservative. Extracts of rosemary, sage, thyme, oregano, and mixtures of several plants of the Lamiaceae (such as provincial herbs) are commonly used by the population. The extracts of these species are available in many forms for seasoning foods such as sauces, dressings, ready-made pasta, and meat.

CONCLUSION

This survey is the first to explore the knowledge of the most medicinal and culinary herbs from the Lamiaceae family by the population of Bejaia province (north-eastern Algeria) to demonstrate their pharmacological effects and food value. The prevalence of usage of medicinal herbs in this department is nearly related to the profile of the persons interrogated. Hence, young persons, likened to the aged, typically do not recognize the names and utility of most plant species. Women and men have a common medicinal awareness, with a minor discrepancy in the proportion of medicinal herb utilization among the two genders, with little benefit going to women. Among the plants explored *Mentha spicata* L. (spearmint), *Lavendula stoechas* L. (lavender), and *Salvia officinalis* L. (sage), are the most used and have more applications. The data procured allowed us to display that the majority of species in the survey region are extensively employed to treat affections of the digestive system, respiratory disorders, and neurological disturbances. As culinary herbs, they are adopted mostly for seasoning and flavouring meat and fish. These applications are principally dealt with leaves, and with the infusion. Finally, it occurs from this study that the ancestral usage of medicinal herbs yet perseveres in the explored department, although the advancement in the medical field.

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دراسة عرقية نباتية لمعظم الشّفويّات المستخدمة كنباتات طبية
وفي طهي من قبل سكان ولاية بجاية، الجزائر

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ملخص

أجريت هذه الدراسة لحماية معرفة معرفة الأجداد حول معظم نباتات الشّفويات الّتي يستخدمها سكان مدينة بجاية (شمال شرق الجزائر) للأغراض الطبية والغذائية. باستخدام 200 ورقة استبيان، تم اجراء دراسات استقصائية عرقية نباتية بين فبراير ويوليو2020. تم تحليل البيانات خلال حساب المؤشرات الكمية مثل تكرار الاقتباس النّسبي (RFC)، ومؤشر استخدام قيمة جزء النّبات (PPV)، ومستوى الإخلاص (FL). وتبين أن النّساء يحتفظن بمعلومات نباتية عرقية (52%) أكثر من الرجال (48%)، ومن المتوقع أن يقدم كبار السّن معلومات أكثر موثوقية وأن غالبية المستخدمين لديهم مستوى جامعي. بخلاف ذلك، يتم استخدام الأدوية العشبية في المناطق الريفية أكثر من المناطق الحضرية ويتم زراعة 55% من النّباتات المدروسة بينما 45 % منها برية. الأوراق هي الجزء الأكثر استخداما (PPV=0.592) وكانت طريقة التسريب هي الأكثر استخداما (69.7%). أظهر التحليل العرقي أن *Mentha spicata* L. (RFC=0.44)، *Lavendula stoechas* L. (RFC=0.215)، و *Salvia officinalis* L.(RFC=0. 205) مستخدمة بشكل متكرر. أمراض الجهاز الهضمي هي المؤشرات العلاجية الرئيسية و41.44% من الأنواع استخدمت لتتبيل اللحوم والأسماك يمكن أن يشكل هذا الاستطلاع مصدرا مهما للمعلومات وقاعدة بيانات لمزيد من البحث في مجالات الكيمياء النّباتية وعلم العقاقير.

الكلمات الدالة: علم النبات العرقي، بجاية، نباتات طبية، الشّفويات، تأثيرات علاجية، استخدامات في الطهي.