

Ethnobotanical Survey of Aromatic and Medicinal Plants Used in Traditional Medicine and Agri-Food in The Fez-Meknes Region

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Abstract

In order to identify the medicinal plants used in agri-food and traditional medicine by the population of Fez-Meknes region (Morocco), a floristic and ethnobotanical study was carried out in 4 provinces of this region (Fez, Meknes, Azrou, Taza). Questionnaire forms were used to survey the usual users of the plants and herbalists and to collect as much information as possible on the therapeutic and dietary use of aromatic and medicinal plants in the region. For plants used for food, our survey identified 29 species divided into 26 genera and 16 families, including herbaceous plants (70%), trees (16.60%), shrubs (10%) and bushes (3.30%). The study of the medicinal flora used in traditional medicine also allowed the inventory 81 species belonging to 47 families. Leaves are the most commonly used part and the majority of remedies were prepared in the form of infusion (47%) and decoction (26%). Among all the diseases treated, digestive diseases are the most cited (25%), followed by dermatological diseases (21%). The present study allowed us to evaluate some traditional practices used by the Fez-Meknes region population. In this context, it is essential to carry out similar investigations in other regions of the kingdom, in order to safeguard this precious natural heritage by means of a monograph that is as complete as possible and to validate the remedies and preparations identified using rigorous scientific protocols.

Keywords: Agri-food; ethnobotany; medicinal plants; monograph; traditional medicine.

INTRODUCTION

According to the WHO (World Health Organization), nearly 6377 species of plants are used in Africa, of which more than 400 are medicinal plants that constitute 90% of traditional medicine. In 2004, nearly 75% of the African population used plants to treat themselves and do not have access to modern medicines, whose pharmaceutical industry still relies heavily on the diversity of secondary plant metabolites to find new molecules with novel biological properties (Mikou et al. 2016)

The use of plants in therapy has been known for a long time. Due to the richness and original diversity of its flora, Morocco constitutes a real phylogenetic reservoir with approximately 4500 species and subspecies of vascular plants. The diversity of the relief and the most varied bio climates associated with them have given rise to a large number of endemic species. The rate of endemism is about 20% of the total number of species (Pousset 1989). However, while there is no denying the curative virtues of a large number of plants, a good knowledge of them (toxicity, form of administration, dose and method of preparation) is essential to select in the mass of actions attributed to plants. In this sense, floristic and ethnobotanical studies have been carried out in different regions of Morocco

and have shown a return of the populations to the traditional use of medicinal plants (Hseini and Kahouadji (2007), Lahsissene and Kahouadji (2010) and Salhi et al. 2010).

The multiplication of these ethnobotanical studies on a national scale will make it possible to gather more information on Moroccan medicinal plants, to enhance them and to preserve some of the knowledge acquired by the local population (Mikou et al. 2016). These ethnobotanical studies are the most approach for discovering new medical plants or focused on those previously identified for their bioactive ingredients (Celestina et al. 2012). In this sense, and in order to highlight the virtues and traditional uses of aromatic and medicinal plants, the present ethnobotanical study was conducted among the population of the Fez-Meknes region.

MATERIALS AND METHODS

Study area

The present ethnobotanical study was carried out in the form of a survey using a pre-established questionnaire with various specific questions about the informant, the vernacular identity of the plant, as well as the part used,

the modes of preparation, the therapeutic and traditional uses.

Study zone

Located in the North Centre of Morocco, the Fez-Meknes region is composed of 2 prefectures (Fez and Meknes) and 7 provinces (Taounate, Taza, Sefrou, El Hajeb, Boulemane, My Yacoub and Ifrane) (Figure 1). The region has three types of climates; a continental climate in the northern part, very hot and dry in summer and cold and wet in winter. A cold and humid climate in mountainous zones, very cold and snowy in winter, temperate in summer and a semi-arid climate in the high hills of Boulemane, where the average rainfall does not exceed 250 mm. The Winter is very cold and snowy.



Figure 1. The Fez-Meknes region on the national map.

Survey procedure

In order to ensure a high degree of objectivity of the data obtained from our study, the survey is conducted using a survey form or questionnaire based on four axes:

- Information about the informant's profile (age, gender, level of education, etc.)
- Choice between the two medicines (modern and traditional)
- Information on the nature and pharmaceutical techniques of the plants used (local name, part used, method of preparation, dose)

- Information on the use of medicinal plants for diseases treatment.

Data analysis

For Data analysis, IBM SPSS Statistics-21 software was used. The Graph-Pad prism 8 software was also used to create graphs.

The frequency of citation was determined as follows:

$$\text{Frequency of citation} = \left(\frac{\text{Number of citations} \times 100}{\text{Total number of citations}} \right)$$

RESULTS

Socio-demographic data

For the use of aromatic and medicinal plants, the results obtained showed a dominance of women gender with 87.3% against 12.7% for men, and the age group of 40 to 60 years with 51%. For education level, those not attending school come first at 41%.

Analysis of medicinal plants catalogue inventoried

Floristic aspect

The study of the medicinal flora has allowed the inventory of 81 species belonging to 47 families. Among the 47 families, the most used are the Lamiaceae with 14 species followed by the Asteraceae (7), Apiaceae (7), Fabaceae (5) and Myrtaceae (3). Table 1 presents a complete analysis of the plants.

Plant parts used and preparation modes

The plant parts used are ranked in decreasing order of importance: leaves (42%), seeds (27%), fruits (10%), stem (9%), and bark (9%). Other parts were presented by 5% (Figure 2.A).

To facilitate the use of medicinal plants, several preparation methods were used, such as decoction, maceration and infusion. In this sense, we obtained that infusion (47%), decoction (26%), whole plant (16%) and cataplasms (11%) were the most used preparation methods (Figure 2.B).

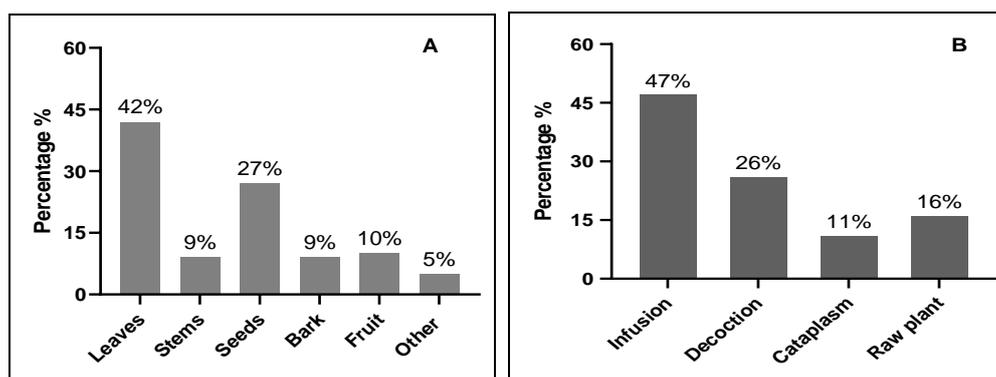


Figure 2. Percentage of parts used (A) and preparation methods (B).

Why do you use traditional medicine

In order to find out the reasons for using traditional medicine, the interviewees were asked this question. The efficacy criteria came first with 48%, followed by the availability of plants and the lower cost with 8% and 7% respectively. While 38% of the respondents stated all three criteria at the same time. The use of medicinal plants constitutes a risk to human health, hence the need to know their toxicity status. For this reason, the

question of toxicity was asked to the herbalists and phytotherapists, 89.2% of whom declared the non-toxicity of the plants most often used in the region. This percentage correlates with the good expertise of these professionals. The survey revealed that 53.9% of these professionals had 10 to 20 years of experience in traditional herbal medicine field, and 21% had more than 20 years (figure 3).

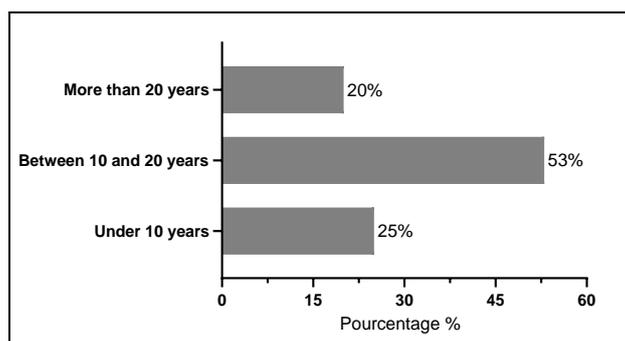


Figure 3. Years of experience of herbalists and practitioners interviewed.

Symptoms treated with aromatic and medicinal plants

Of all the diseases treated, digestive diseases are the most cited (25%), followed by dermatological diseases (21%) and cardiovascular diseases (15%) (Figure 4).

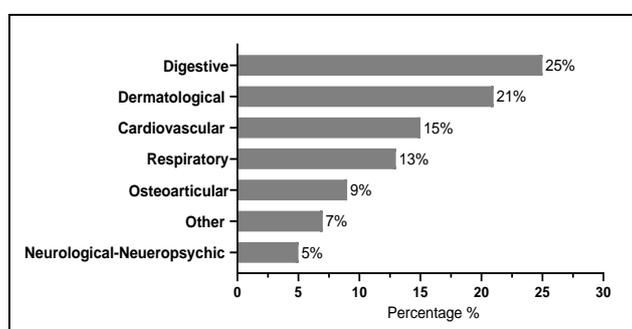


Figure 4. Symptoms treated with aromatic and medicinal plants.

Table 1. List of plants used for food purposes.

Common name	Scientific name	Family	Biological form	Preparation method	Part used	Nutritional interest	Number of citations
Le bugle	<i>Ajuga iva</i>	<i>Lamiaceae</i>	Herbaceae	Fresh	Leaves	Rich in calcium, potassium, and antioxidants. Use for the urinary system diseases.	3
Malva, la Mouve	<i>Malva sylvestris</i>	<i>malvaceae</i>	Herbaceae	Cooked	Leaves, Stem	Rich in vitamins C and E, unsaturated fatty acids with metabolic and digestive benefits.	5
Le palmier nain	<i>Chamaerops humilis</i>	<i>Arecaceae</i>	Shrub	Fresh	Fruit, Root	Antioxidants, omega 3, 6 and 9 and vitamins A, B, C, E. Interest in blood pressure regulation.	1
L'arbousier	<i>Arbutus unedo</i>	<i>Ericaceae</i>	Shrub	Fresh	Fruit	- Rich in vitamin C	2

Common name	Scientific name	Family	Biological form	Preparation method	Part used	Nutritional interest	Number of citations
						-Antioxidants - Regulation of cholesterol synthesis.	
Chardon d'Espagne	<i>Scolymus hispanicus</i>	Astéraceae	Herbaceae	Cooked and fresh	Leaves, Stem	Composed of inulin (simple sugar) with metabolic interest in passing kidney stones.	6
La ronce	<i>Rubus fruticosus</i>	rosaceae	Shrub	Fresh	Fruit	Rich in vitamin C and all forms of vitamin B (except B12).	2
Cardon	<i>Cyanara cardunculus</i>	Astéraceae	Herbaceae	Cooked	Leaves, Stem	High mineral and vitamin B content.	3
-	<i>Rhus pentaphylla</i>	Anacardiaceae	Shrub	Fresh	fruit	--	1
L'oléastre	<i>Olea europea</i>	oleaceae	Tree	Oil	Fruit	Rich in fatty acids: omega 3, 6, 9 with digestive and metabolic benefits.	2
Romarin	<i>Rosmarinus officinalis</i>	Lamiaceae	Herbaceae	Cooked	Leaves	Metabolic interest and use in the digestive system.	2
Fenouil	<i>Foeniculum vulgare</i>	Apiaceae	Herbaceae	Cooked	Stem, bulb	Rich in vitamins B, C, D, E. Metabolic interest and use for digestive system.	2
Le jujubier	<i>Zizyphus lotus</i>	Rhamnaceae	Tree	Fresh	fruit	Use for the digestive and genito-urinary system.	5
Le thym	<i>Thymus bleicherianthus</i>	Lamiaceae	Herbaceae	Cooked	Leaves and whole plants	Use for the treatment of digestive tract.	4
-	-	-	Herbaceae	Cooked	Leaves and stem	Metabolic interest.	4
Pourpier potage	<i>Portulaca oleracea</i>	portulacaceae	Herbaceae	Cooked	Leaves and stem	Rich in omega 3.	4
Chêne verte	<i>Quercus ilex</i>	Fagaceae	Tree	Fresh	Seeds	Potassium, calcium, phosphorus with interest in metabolic, regulation of glycemic and digestive tract disorders.	5
Menthe à feuille ronde	<i>Mentha rotundifolia</i>	lamiaceae	Herbaceae	Cooked	Leaves and stem	Digestive tract and respiratory system.	5
Le myrte	<i>Myrtus communis</i>	Myrtaceae	Tree	Fresh	Fruit	Use for fatigue and digestive tract.	4
Petite férule	<i>Elaeoselinum asclepium</i>	Apiaceae	Herbaceae	Fresh and cooked	Leaves and stem	Metabolic interest.	1
La férule	<i>Ferula communise</i>	Apiaceae	Shrub	Cooked	Flowers	Anticoagulation.	2
Lavande	<i>Lavandula multifidal</i>	Lamiaceae	Shrub	Cooked	Leaves	Treatment of digestive tract and respiratory system.	3
Grande oseille	<i>Rumex acetosa</i>	Polygonacéeae	Herbaceae	Fresh and cooked	Leaves	Rich in vitamin C with metabolic interest.	4
Ache aquatique	<i>Apium nodiflorum</i>	Apiaceae	Herbaceae	Cooked	Leaves	High content of calcium, vitamin E, B9, and antioxidants.	4
La bette	<i>Beta vulgaris</i>	Amaranthaceaeou chenopodiacae	Herbaceae	Cooked	Leaves	Vitamin C, potassium and iron.	3
Origan compact	<i>Origanum compactum Bentham.</i>	Lamiaceae	Herbaceae	Cooked	Leaves and whole plants	Treatment of gastric pains.	4
Moutard des champs	<i>Sinapis arvensis</i>	Brassicaceae	Herbaceae	Cooked	Leaves	Metabolic interest.	3
Lavande papillon	<i>Lavandula stoechas</i>	Lamiaceae	Herbaceae	Cooked	Leaves and whole plants	Use for the treatment of digestive tract and respiratory system.	4

Common name	Scientific name	Family	Biological form	Preparation method	Part used	Nutritional interest	Number of citations
Caroubier	<i>Ceratonia siliqua</i>	<i>Fabaceae</i>	Tree	Flour	Fruit	Rich in carbohydrates, vitamin A, amino acids and fatty acids.	6

Table 2. List of plants for medical use.

Common name	Scientific name	Family	Therapeutic use	Frequency of citation	Percentage of citation
Globulaire	<i>Globularia alypum L.</i>	Plantaginaceae	Eczema, gout, digestive problems, diabetes, sports perspiration and wound healing.	10	9.25%
Thym serpolet	<i>Thymus serpyllum</i>	Lamiaceae	Treatment of cough, digestive disorders, colic.	81	80.14%
La rue d'Alep	<i>Ruta Chalepensis.L</i>	Rutaceae	Hair care, dermatological, respiratory, oral and digestive diseases.	6	5.55%
Caroubier	<i>Ceratonia siliqua L</i>	Leguminosae (Cesalpiniaceae)	Regulation of intestinal transit, hypercholesterolemia.	8	7.40%
Ricin	<i>Ricinus communis</i>	Euphorbiaceae	Hair care.	1	0.92%
Aubépine	<i>Crataegus monogyna</i>	Rosaceae	Cardiovascular system, Stress and sleep disorders.	6	5.70%
Chénopode	<i>Chenopodium ambrosioides</i>	Amaranthaceae	Treatment of fever, asthma and other ailments.	8	7.25%
Marrube blanc	<i>Marrubium vulgare</i>	Lamiaceae	Gastrointestinal diseases, cough and bronchitis.	3	2.77%
Carvi	<i>Carum carvi L.</i>	Apiaceae	Digestion, expectoration, colic, sometimes for rheumatic problems.	14	12.81%
Laurier rose	<i>Nerium oleander.L</i>	Apocynaceae	Dermatological problems, Dental infections, Fever.	20	18.51%
Verveine odorante	<i>Aloysia citriodora</i>	Verbenaceae	Nervousness, sleep disorders.	7	6.48%
Lavande	<i>Lavandula angustifolia P.Mill</i>	Lamiaceae	Genito-urinary problems, digestive tract, hair and skin care.	11	10.18%
khella	<i>Ammi visnaga (L.) Lam</i>	Apiaceae (umbelliferae)	Oral and dental infections, respiratory disorders.	78	72.22%
Romarin	<i>Rosmarinus officinalis L.</i>	Lamiaceae	Asthma and colds, digestive tract, hair care.	63	58.33%
Girofle	<i>Syzygium aromaticum</i>	Myrtaceae	Antiseptic, urinary tract infections.	6	5.55%
Fenugrec	<i>Trigonella foenum graecum</i>	Fabaceae	Treatment of gastralgia, appetite, digestion, hypercholesterolemia.	32	29.62%
Harmel	<i>Peganum harmala</i>	Zygophyllaceae	Rheumatism, healing and burns.	4	3.70%
Souchet long	<i>cyperus longus</i>	Cyperaceae	Inflammation and pain, anti-convulsant properties.	1	0.92%
Jujubier	<i>Ziziphus lotus</i>	Rhamnaceae	Soothing; anxiety, regulation of intestinal transit.	6	5.55%
Roseau à massette	<i>Typha latifolia L.</i>	Typhaceae	Analgesic, carminative.	2	1.85%
Thuya de barbarie	<i>Tetraclinis articulata</i>	Cupressaceae	Treatment of intestinal infections, fever, hair and skin care.	3	2.77%
Herniaire	<i>Herniaria hirsuta</i>	Caryophyllaceae	Renal calculi, urinary tract.	1	0.92%
Achillée des marais	<i>Achillea odorata L. subsp</i>	Astéracées	Rheumatism, tonic, stimulant.	1	0.92%
Myrte	<i>Myrtus communis</i>	Myrtaceae	Treatment of arthralgia..	7	6.48%
Henné	<i>Lawsonia inermis</i>	Lythraceae	Hair colouring, dermatological problems.	12	11.11%
Cresson alénois	<i>Lepidium sativum</i>	Brassicaceae	Anti-rheumatic, lung diseases, gastric problems, and to boost immunity.	9	8.33%
Haricots noirs	<i>Phaseolus vulgaris</i>	Fabaceae	Anti-inflammatory properties.	2	1.85%
Vigne à vin	<i>Vitis vinifera L.</i>	Vitaceae	Against abscesses and constipation.	1	0.92%

Common name	Scientific name	Family	Therapeutic use	Frequency of citation	Percentage of citation
Le cubèbe	<i>piper cubeba</i> L.f.	Piperaceae	Tonic, stimulant, culinary, antiashmatic.	1	0.92%
Menthe odorante	<i>Mentha suaveolens</i>	Lamiacées	Tonic, stomachic and antispasmodic effects.	5	4.62%
Ortie	<i>Urtica dioica</i>	Urticaceae	Antirheumatic, treatment of inflammation, diuretic, antidiabetic.	1	0.92%
Souci des champs	<i>Calendula arvensis</i>	Asteraceae	Gastric inflammations.	1	0.92%
Sauge à feuilles verveine	<i>Salvia verbenaca</i>	Lamiaceae	Regulation of perspiration; menstrual cycle.	6	5.55%
Rosier	<i>Rosa centifolia</i>	Rosaceae	Wellness, anxiety.	3	2.77%
Pin maritime	<i>Pinus pinaster</i> Ait	Pinaceae	Treatment of respiratory diseases, pain relief for rheumatic diseases.	1	0.92%
Laurier	<i>Laurus nobilis</i>	Lauraceae	Antibacterial, Antiviral, Antiseptic, Fungicide, Decongestant, Nervous system regulator, Digestion and Anxiety.	8	7.40%
Inule visqueuse	<i>Dittrichia viscosa</i>	Asteraceae	Constipation, Gastrointestinal diseases.	3	2.77%
Marjolaine	<i>Origanum majorana</i>	Lamiacées	Digestive disorders, flatulence, nausea, intestinal spasms, diarrhea; nervous disorders, migraines, insomnia.	9	8.33%
Oseille de Guinée	<i>Hibiscus sabdariffa</i>	Malvaceae	Treatment of respiratory tract inflammations, high blood pressure, cholesterol, fever and stomach pains.	1	0.92%
Ail	<i>Allium sativum</i>	Amaryllidaceae	Prevention of cardiovascular disease, cancer.	3	2.77%
Oursins	<i>Echinops spinosus</i>	Asteraceae	Dermatological diseases.	12	11.11%
Armoise	<i>Artemisia vulgaris</i>	Asteraceae	Treatment of digestive disorders, joint and muscle pain and insomnia.	11	10.18%
Magydaris	<i>Magydaris panacifolia</i>	Apiaceae	Hair care and dermatological diseases.	1	0.92%
Garou	<i>Daphne gnidium</i>	Thymelaeaceae	Hair care and dermatological diseases.	8	7.40%
Cumin velu	<i>Ammodaucus leucotrichus</i>	Apiaceae	Treatment of respiratory diseases and intestinal disorders.	8	7.40%
Melissa	<i>Melissa officinalis</i>	Lamiaceae	Calming (nervous disorders, stress, anxiety, anguish), antispasmodic (stomach, intestine), heart problems (tachycardia).	2	1.85%
Arganier	<i>Argania spinosa</i>	Sapotaceae	Cosmetic application (face and body care).	1	0.92%
Nerprun alaterne	<i>Rhamnus alaternus</i> L.	Rhamnacées	Anxiety, digestion, constipation.	3	2.77%
Sauge	<i>Salvia officinalis</i>	Lamiacées	Digestion, stress, anxiety, cough.	5	4.62%
Eucalyptus	<i>Eucalyptus gunnii</i>	Myrtaceae	Anti-inflammatory and analgesic, treatment of respiratory problems.	9	8.33%
Jasmin	<i>Jasminum polyanthum</i>	Oleaceae	Anxiety.	1	0.92%
Lupinus	<i>Lupinus luteus</i>	Fabaceae	Prevention of cardiovascular and skin diseases.	2	1.85%
Noyer	<i>Juglans regia</i>	Juglandaceae	Natural toothbrush, natural antifungal.	3	2.77%
Figuier	<i>Opuntia ficus indica</i>	Cactaceae	Diuretic activity.	1	0.92%
Bergamote	<i>Citrus bergamia</i>	Rutaceae	Digestive disorders, stress, mouth and skin infections.	1	0.92%
Coriandre	<i>Coriandrum sativum</i> .L	Apiaceae	Digestive disorders and diarrhea, and to induce sleep.	8	7.41%
Aristolochie	<i>Aristolochia paucinervis</i>	Aristolochiaceae	Digestive disorders, analgesic	1	0.92%
Origan, thym commun	<i>Thymus vulgaris</i>	Lamiaceae	Tonic, digestive diseases.	29	26.85%

Common name	Scientific name	Family	Therapeutic use	Frequency of citation	Percentage of citation
Coquelicot	<i>Papaver rhoeas</i>	Papaveraceae	Insomnia, respiratory diseases.	16	14.81%
Coloquinte	<i>Citrullus colocynthis</i>	Cucurbitacées	Diuretic activity.	2	1.85%
Valériane	<i>Valeriana officinalis</i>	Valerianaceae	Sleep disturbances.	2	1.85%
Garance	<i>Rubia tinctorum.L</i>	Rubiacées	Stomach diseases, anti diarrhea..	1	0.92%
Dauphinelle staphisaigre	<i>Delphinium staphisagria</i>	Ranunculaceae	Hair care.	1	0.92%
Euphorbe	<i>Euphorbia resiniphera</i>	Euphorbiaceae	Wound healing, ophthalmic diseases.	17	15.74%
Millepertuis	<i>Hypericum perforatum</i>	Hypericaceae	Anxiety, sleep problems.	14	12.96%
Colchique d'automne, safran des près	<i>Conopodium majus koch</i>	Apiaceae	Weight gain.	1	0.92%
Séné	<i>Senna alexandrina</i>	Caesalpinaceae	Laxative, constipation.	1	0.92%
Anis étoilé	<i>Illicium verum</i>	Illiciaceae	Anti-inflammatory, intestine.	2	1.85%
Lin	<i>Linum usitatissium</i>	Linaceae	Inflammation, gastritis, hair care.	3	2.77%
Fenouil, Aneth doux	<i>Foeniculum vulgare</i>	Apiaceae	Anxiety, insomnia, vomiting, gastrointestinal and respiratory disorders.	7	6.48%
Carline	<i>Atractylis gummifera</i>	Asteraceae	Appetite, stomach.	3	2.77%
Gingembre	<i>Zingiber officinale</i>	Zingibéraceae	Muscle pain, digestion.	1	0.92%
Géranium	<i>Geranium robertianum</i>	Géraniacées	Stress and anxiety.	1	0.92%
Camomille romaine	<i>Chamomilla nobilis</i>	Astéracées	Anxiety, insomnia.	2	1.88%

DISCUSSION

At the end of this survey, 29 species of plants for food use were identified, which were divided into 26 genera and 16 families, including herbaceous plants (70%), trees (16.60%), shrubs (10%) and bushes (3.30%). The study of the medicinal flora used in traditional medicine has also allowed the inventory of 81 species belonging to 47 families.

For the socio-demographic data, the results obtained showed a dominance of female gender with 87.3% against 12.7% for men, and the age group of 40 to 60 years with 51%. For education level, those not attending school come first at 41%. In this sense, several ethnobotanical studies carried out on a national scale have also confirmed these results (Ziyyat et al. 1997), Hmamouchi (1999), (Jouad et al. 2001), (Eddouks et al. 2002), (Tahraoui et al. 2007), (Mehdioui and Kahouadji 2007), (Salhi et al. 2010) and (Benkhnigui et al. 2012).

For the used part, we obtained that the leaves are the most used (42%). Then, seeds (27%), fruits (10%), stem (9%), bark (9%), and other parts were presented by 5%. Several studies also confirmed these results (EL Rhaffari and ZAID (2008), Bammou et al. 2015) and Umartani and Nahdi (2021). Although the use of leaves is represented by an important percentage, it was noted during the survey, that some users proceed to pull the whole plant instead of being interested only in the desired part. On the other hand, there is a clear relationship between the used part of the plant and the effects of this exploitation on its existence (Cunningham

1996), this mode of collection seriously compromises the sustainability of medicinal species, especially bulbous ones. Knowing that the leaves are the seat of photosynthesis and sometimes of the storage of secondary metabolites responsible for the biological properties of the plant (Bigendako-polygenis and Lejoly 1990), the ease and speed of harvesting (Bitsindou 1986) may be the cause of the high rate of use of foliage by the region population.

The use of medicinal plants is done by several modes of preparation. In this study it was obtained that the majority of the remedies are prepared by infusion (47%) and decoction (26%). As the respondents do not have ideas about the precise quantities and measures in the preparation and dosage of phytomedicines. Precision is lacking on several plants such as the quantities of plant organs to be prepared, the solvent or vehicle used, the time needed to prepare the solutions (decoction, infusion, powder, fumigation, poultice, maceration and daubing) and the precise dose to be prescribed. However, the infusion (47%) and decoction (26%) remain the most commonly used methods of preparation. This percentage shows that the local population grows to the decoction mode and finds it adequate to warm the body and disinfect the plant (Lahsissene and Kahouadji 2010). On the other hand, decoction allows the collection of the most active principles and attenuates or cancels the toxic effect of certain recipes.

The results obtained showed that most medicinal plants are widely used in the care of the digestive system

(25%). Our results are also confirmed by those of Hmamouchi and Agoumi (1993) who conducted a study in the Mechraâ Bel Ksiri region, Hseini and Kahouadji (2007) in the region of Rabat, Mehdioui and Kahouadji (2007) in the province of Essaouira, Salhi et al. (2010) in Kenitra city and Lahsissene and Kahouadji (2010) in the Zaër region.

Other plants are also used to treat dermatological diseases (21%) and cardiovascular diseases (15%). According to respondents and their clients, these herbal recipes have therapeutic action, which suggests that they include many bioactive ingredients that are essential to the living flora's physiological processes. As a result, they are thought to be more compatible with human bodies (Agbatutu et al., 2022).

CONCLUSIONS

Traditional phytotherapy was and still, currently in demand by people who have confidence in trusting in the popular uses of plants and not having resources and access to modern medicine. The present work was carried out with the aim of making as complete an inventory as possible of the medicinal plants used in the Fez-Meknes region (Morocco) and to gather information concerning the practical therapeutic uses in this region. The results obtained showed that of the 47 families inventoried, the Lamiaceae is the most represented with 14 species (29.78%). On the ethnobotanical and pharmacological side, the leaves are the most commonly used part. Decoction and infusion are the most commonly used method. Similarly, of all the diseases treated, digestive diseases are the most cited. In addition, our results showed an important diversity of wild edible species in the Fez-Meknes region, which represents a significant asset for food and nutritional diversification.

The present study allowed us to evaluate some traditional practices used by the population of Fez-Meknes region. A wealth of knowledge and expertise has been shown. In this context, it is essential to carry out similar investigations in other regions of the kingdom in order to safeguard this precious natural heritage by means of a monograph that is as complete as possible, and to validate the remedies and preparations identified by means of rigorous scientific protocols.

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