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ETHNOBOTANICAL STUDY AND INVENTORY OF MEDICINAL PLANTS USED IN TRADITIONAL MEDICINE IN THE SIKKDA REGION (NORTHEAST ALGERIA)

Actuality. Traditional medicine has been, and still remains, widely used by populations who trust the popular uses of medicinal and aromatic plants and who cannot afford modern medical care.

The aim. To establish a list of medicinal plants used in traditional phytotherapy by the local population of two municipalities in the Skikda region (Collo and El Hadaiek).

Material and methods. This work was conducted through an ethnobotanical survey carried out in 2024 among the local population using 120 questionnaire forms.

Research results. The results allowed for the identification of 64 medicinal species belonging to 37 botanical families, with the Lamiaceae family being the most represented. Leaves were the most commonly used plant part, and most remedies were prepared as herbal teas. Analysis of the informants' profiles showed that women use medicinal plants more than men, with a usage rate exceeding 60%, and that the age group between 20 and 40 years is the most actively involved in this practice.

Among all the reported ailments, digestive disorders were the most frequently cited.

Conclusion. The study enriches the repertoire of plants used for therapeutic purposes in Algeria and contributes to enhancing knowledge about traditional medicine and preserving local traditional knowledge.

Key words: medicinal plants, ethnobotanical survey, traditional use, Skikda, Algeria.

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ЕТНОБОТАНІЧНЕ ДОСЛІДЖЕННЯ ТА ІНВЕНТАРИЗАЦІЯ ЛІКАРСЬКИХ РОСЛИН, ЯКІ ВИКОРИСТОВУЮТЬСЯ У ТРАДИЦІЙНІЙ МЕДИЦИНІ РЕГІОНУ СКІКДА (ПІВНІЧНИЙ СХІД АЛЖИРУ)

Актуальність. Традиційна медицина була й залишається дуже поширеною серед населення, яке довіряє народним способам використання лікарських і ароматичних рослин і не має доступу до сучасної медичної допомоги.

Мета дослідження – скласти перелік лікарських рослин, які використовуються у традиційній фітотерапії місцевим населенням двох муніципалітетів регіону Скікда (Колло й Ель-Хадаєк).

Матеріал і методи. Робота була проведена шляхом етноботанічного опитування, проведеного у 2024 році серед місцевого населення з використанням 120 анкет.

Результати дослідження. У результаті було ідентифіковано 64 лікарські види, що належать до 37 ботанічних родин, з яких родина *Lamiaceae* була найбільш представлена. Найчастіше використовуваною частиною рослин були листя, а більшість засобів готували як настої. Проведений аналіз профілів інформантів показав, що жінки використовують лікарські рослини частіше за чоловіків (понад 60%), а найбільш активною віковою групою є особи віком від 20 до 40 років. Серед усіх зазначених захворювань найбільш поширеними були розлади травної системи.

Висновок. Це дослідження збагачує перелік лікарських рослин, які використовуються в Алжирі, і сприяє розширенню знань про традиційну медицину та збереженню місцевих традиційних знань.

Ключові слова: лікарські рослини, етноботанічне опитування, традиційне використання, Скікда, Алжир.

Introduction. Actuality. Since ancient times, humanity has used various plants found in its environment to treat and cure all kinds of diseases. To this day, plants continue to play a crucial role in the art of healing worldwide.

According to the World Health Organization (2003), in some developing countries in Asia, Africa, and Latin America, 80% of the population relies on traditional medicine, especially in rural areas. This is due to its proximity, accessibility, affordability, and, most impor-

tantly, the lack of access to modern medicine in these regions (Zeggwagh et al., 2013).

Traditional medicine is undoubtedly an integral part of Algerian culture. In Algeria, traditional medicine has been widely practiced for a long time, thanks to the richness and diversity of its flora (Sakhraoui, 2025), which serves as a valuable phylogenetic reservoir, with approximately 3,000 species belonging to various botanical families (Bouzid et al., 2017).

Algeria, and particularly the Skikda region (North-eastern Algeria), with its diverse climate (Mediterranean, humid) and varied soil types, possesses a rich flora of medicinal plants, most of which grow wild. The valorization of these plants remains an area of great importance for the country.

The aim of the study light on ancestral knowledge that has no written records. Indeed, traditional know-how is currently held by only a few individuals and information on regional medicinal plants is highly fragmented, scattered and even scarce for certain areas such as Collo which is part of a biogeographical sector considered to be one of the hotspots of the Mediterranean basin, with a very high biodiversity index on a national scale (Véla & Benhouhou, 2007), making this study particularly valuable.

Whose objective is to compile a list of medicinal plants used in traditional phytotherapy by the local population of two areas.

In this article, we present the therapeutic use of medicinal plants in the Skikda region. This study, conducted through questionnaires and interviews with local residents of two municipalities (El Hadaiek and Collo).

Materials and research methods. The study was conducted in the Skikda province, located in northeastern Algeria, along the Mediterranean coast. More specifically, the surveys were carried out in two municipalities, Collo and El Hadaiek.

Collo is a mountainous and coastal municipality, situated in the Tell Atlas range. It is characterized by its dense forest cover, humid Mediterranean climate, and rich plant biodiversity. It is considered a biogeographical hotspot in Algeria, where traditional practices related to phytotherapy are still deeply rooted in the local culture.

El Hadaiek is a municipality located near the city of Skikda. It features gentler topography, combining agricultural areas and semi-urban neighborhoods, where traditional knowledge of medicinal plants still persists, although it is partly influenced by modern practices.

These two municipalities were selected for their ecological contrasts and cultural diversity in the use of medicinal plants.

The study was conducted in 2024 through interviews based on 120 questionnaire sheets (60 per municipality). The questionnaire was divided into two parts:

Personal Information: Collecting data about the respondent, such as age, gender, and education level.

Medicinal Plant Usage: Gathering information on the local/common name of the plant, the plant parts used, the method of preparation, the diseases treated, etc.

Participants were randomly selected for the survey.

The identification of the plant species mentioned in the questionnaires was carried out through a combination of

field observations and cross-referencing with recognized taxonomic and ethnobotanical sources. The vernacular names provided by respondents were first collected, then matched with their scientific equivalents using reference works such as (Quezel & Santa, 1962–1963). Additional verification was conducted using online databases such as The Plants of the World Online (POWO), managed by the Royal Botanic Gardens, Kew. This approach ensured accurate and rigorous identification and classification of the species, while taking into account regional variations in vernacular nomenclature.

Research results and their discussion. Field surveys revealed that knowledge of medicinal plants (parts used, properties, preparation methods) is the result of long-standing experience passed down by elders.

Ethnobotanical and Pharmacological Aspects.

Use of Medicinal Plants. Plant Parts Used.

The results obtained indicate that in the El Hadaiek area, individuals aged 31 to 40 years are the most frequent users of medicinal plants, while in the Collo region, the 20 to 30-year-old age group has the highest usage rate.

People aged 41 to 60 years use medicinal plants occasionally, mainly when medical treatment does not yield results after a few days.

The youngest (<20 years old) and the oldest (>60 years old) have a mixed opinion regarding the use of medicinal plants (fig. 1).

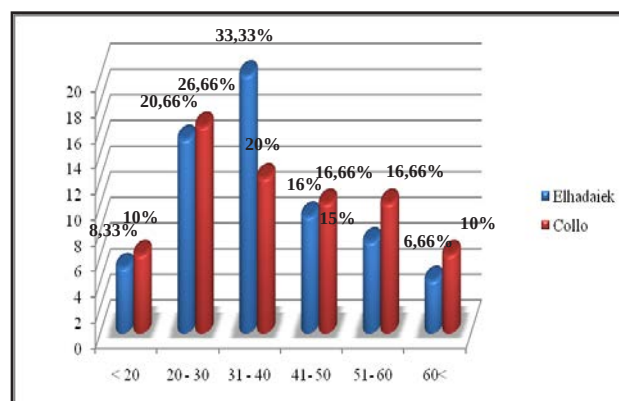


Fig. 1. Use of Medicinal Plants by Age Group

It is noted that women represent the most significant category in the use of medicinal plants to treat various diseases compared to men. Indeed, this category shows a higher percentage than men in the two localities of our study (fig. 2).

Education Level. In the Collo region, the highest use of medicinal plants was recorded among individuals with a university level, while in the El Hadaiek region, the highest usage was among those with a sec-

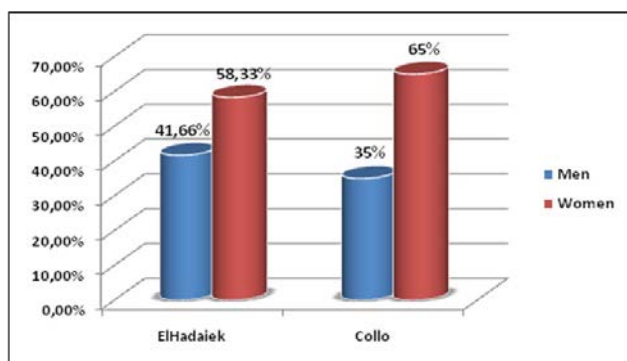


Fig. 2. Distribution of Medicinal Plant Users by Gender

ondary education level, compared to other user categories (fig. 3).

This knowledge has been passed down and instilled by older family members, such as parents, grandparents, or close relatives (e.g., uncles or aunts).

However, it was observed that illiterate groups and individuals with some level of education (such as primary and middle school levels) also exhibited a relatively high usage rate of medicinal plants.

In the Collo region, the usage rates were 11,66% for both illiterate and primary-level individuals and 8,33% for middle school-level individuals. In the El Hadaiek region, the rates were 16,66, 20, and 15%, respectively.

This finding highlights the growing awareness of the importance of phytotherapy, as well as the development and transmission of this ancestral tradition across various user categories.

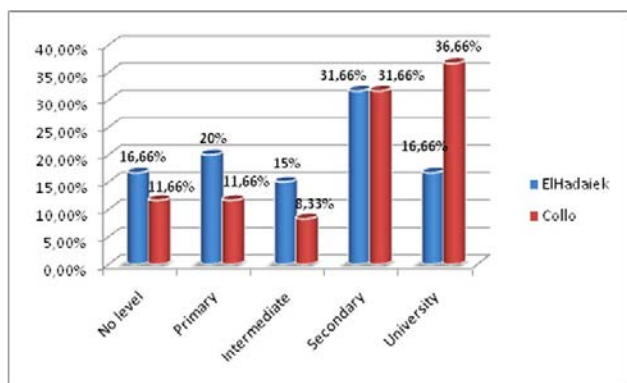


Fig. 3. Use of Medicinal Plants by Education Level

Use of Medicinal Plants. Plant Parts Used. Ethnobotanical surveys conducted among local populations in the study areas indicate a high frequency of leaf usage, followed by seeds.

Flowers and aerial parts come next. Roots are used occasionally by a small proportion of respondents, while bark is used by 4,87%.

The use of bulbs, whole plants, flower buds, seed oils, and rhizomes is less common, with each accounting for 2,5% (fig. 4).

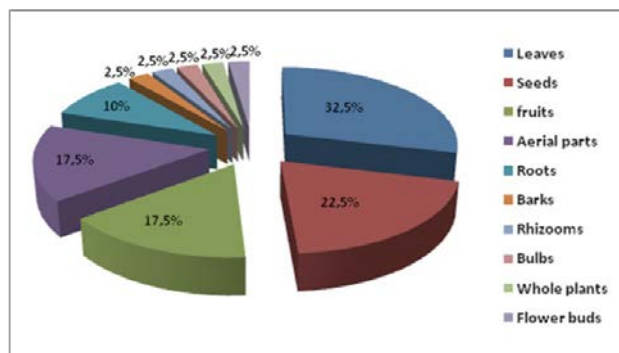


Fig. 4. Plant Parts Used in Medicinal Plants in the Two Study Areas

Method of Preparation. The majority of respondents prefer to prepare remedies in the form of herbal tea (70%). However, some others show a preference for using extracts, powders, and essential oils (fig. 5).

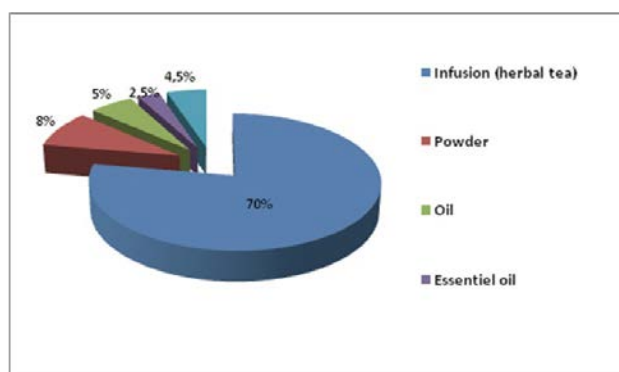


Fig. 5. Methods of Preparation

Treated Diseases. The survey results indicate that digestive system diseases are the most frequently treated. These are followed by respiratory system diseases, metabolic disorders such as diabetes, and neurological disorders, with a recorded prevalence of 5% for the latter.

Genitourinary disorders, glandular diseases, osteo-articular disorders, dermatological diseases, and cardiovascular disorders are the least represented, with percentages ranging between 1 and 3% (fig. 6).

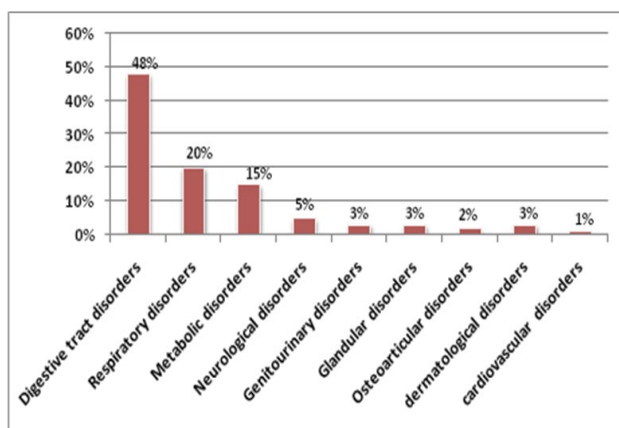


Fig. 6. Use of Medicinal Plants by Type of Disease

Inventory of Medicinal Plants. The study conducted in the northeastern region of Algeria allowed us to establish a final list of medicinal plants used by the local population to treat certain illnesses using various methods (table).

Distribution of Medicinal Plants by Botanical Families. The 64 species of wild medicinal plants recorded belong to 37 families. We note the predominance of *Lamiaceae*, followed by *Asteraceae*, *Apiaceae*, *Ranunculaceae* and *Rhamnaceae*. Seven families (*Ericaceae*, *Fabaceae*, *Linaceae*, *Myrtaceae*, *Papaveraceae*, *Poaceae*, *Plantaginaceae*) have a rate equal to 5,40%. The remaining families are represented by a rate of 2,70% (fig. 7).

The exploration of natural resources, particularly plants, continues to play a fundamental role, especially

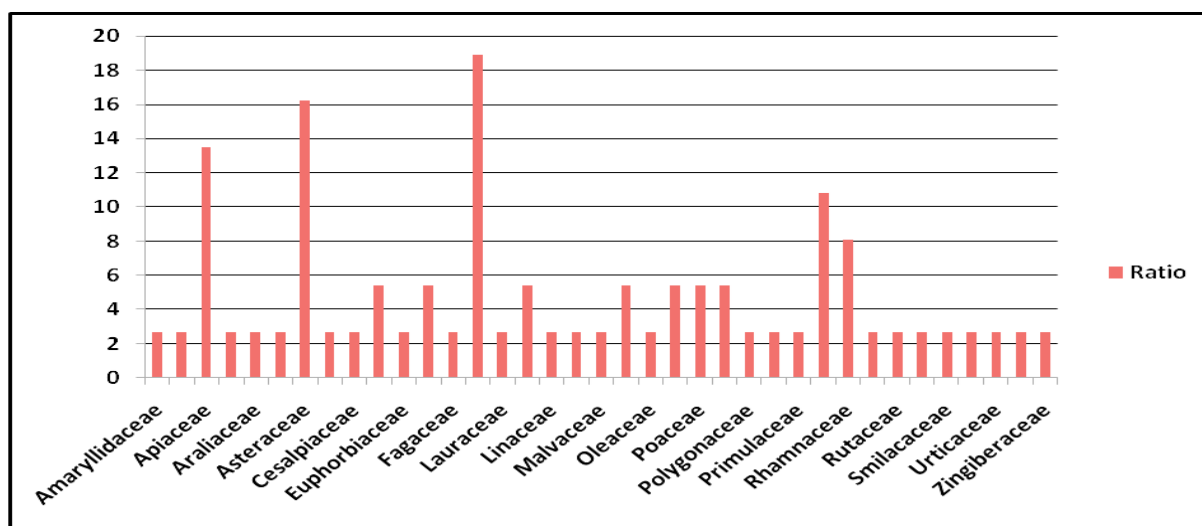


Fig. 7. Distribution of Medicinal Plants by Botanical Families (%)

Table

Medicinal plants and their uses in phytotherapy

Latin Name	Family	Disease treated	Method of preparation	Part used	Status
<i>Allium triquetrum</i> L.	Amaryllidaceae	Reduces blood cholesterol levels, tonsillitis	Decoction	Aerial parts, bulbs	Spontaneous
<i>Anagallis arvensis</i> L.	Primulaceae	Skin diseases	Ointment	Aerial parts	Spontaneous
<i>Apium graveolens</i> L.	Apiaceae	Reduces body acidity, bronchitis, sore throat	Infusion	Aerial parts	Spontaneous
<i>Arbutus unedo</i> L.	Ericaceae	Astringent, diarrhea, antiseptic	Infusion	Fruits, leaves	Spontaneous
<i>Artemisia herba-alba</i> Asso.	Asteraceae	Genital system, vomiting, stomach, intestinal worms	Decoction	Leaves	Spontaneous
<i>Asparagus acutifolius</i> L.	Asparagaceae	Diuretic, kidney health	Decoction	Aerial parts	Spontaneous
<i>Asphodelus microcarpus</i> Salzm. & Viv.	Asphodelaceae	Pain related to flu, burns	Infusion	Roots	Spontaneous
<i>Borago officinalis</i> L.	Boraginaceae	Skin problems, scabies	Decoction	Leaves	Spontaneous
<i>Calendula arvensis</i> L.	Asteraceae	Enuresis or bedwetting	Poultice	Flowers	Spontaneous
<i>Cassia acutifolia</i> Del.	Fabaceae	Infections, fatigue	Infusion	Leaves, pods	Spontaneous

Latin Name	Family	Disease treated	Method of preparation	Part used	Status
<i>Cerantonia siliqua</i> L.	<i>Fabaceae</i>	Colon, constipation, stomach	Infusion	Pods	Spontaneous
<i>Citrus × limon</i> (L.) Osbeck.	<i>Rutaceae</i>	Scurvy, colds, digestive problems	Infusion	Peel, oil	Cultivated
<i>Clematis cirrhosa</i> L.	<i>Ranunculaceae</i>	Antibacterial, antioxidant	Infusion	Leaves, fruits	Spontaneous
<i>Crataegus azarolus</i> L.	<i>Rosaceae</i>	Atherosclerosis, cardiac fatigue, hypertension	Powder, syrup	Fruits	Spontaneous
<i>Crataegus monogyna</i> Jacq.	<i>Rosaceae</i>	Atherosclerosis, cardiac fatigue, hypertension, hypotension	Syrup, infusion	Flowers, berries	Spontaneous
<i>Cuminum cyminum</i> L.	<i>Apiaceae</i>	Used to cool the spleen or reduce excess heat in the liver, improves appetite	Infusion	Seeds	Cultivated
<i>Cynara humilis</i> L.	<i>Asteraceae</i>	Liver diseases, cholesterol	Infusion	Leaves	Spontaneous
<i>Daphne gnidium</i> L.	<i>Thymelaeaceae</i>	Skin diseases	Tincture	External use	Spontaneous
<i>Erica arborea</i> L.	<i>Ericaceae</i>	Urinary tract infections, diuretic	Infusion	Leaves, flowers	Spontaneous
<i>Eucalyptus globulus</i> Labil.	<i>Myrtaceae</i>	Cough, cold, bronchitis	Tincture	Leaves, oil	Cultivated
<i>Ficaria verna</i> Huds.	<i>Ranunculaceae</i>	Hemorrhoids, varicose veins	Infusion, powder	Leaves (external)	Spontaneous
<i>Foeniculum vulgare</i> Mill.	<i>Apiaceae</i>	Digestive problems, colic	Decoction, infusion	Seeds, essential oil	Spontaneous
<i>Fraxinus oxyphylla</i> M.Bieb.	<i>Oleaceae</i>	Rheumatism, inflammation	Poultice	Leaves	Spontaneous
<i>Fumaria capreolata</i> L.	<i>Papaveraceae</i>	Skin disorders	Decoction	Aerial parts, leaves	Spontaneous
<i>Hedera helix</i> L.	<i>Araliaceae</i>	Cough, bronchitis	Infusion	Leaves	Cultivated
<i>Hordeum vulgare</i> L.	<i>Poaceae</i>	Digestive health, cholesterol	Infusion	Grains	Spontaneous
<i>Ditrichia viscosa</i> (L.) Greuter	<i>Asteraceae</i>	Wound healing, respiratory issues	Inhalation, poultice	Leaves	Spontaneous
<i>Laurus nobilis</i> L.	<i>Lauraceae</i>	Digestive issues, respiratory problems	Infusion	Leaves, oil	Spontaneous
<i>Lavandula stoechas</i> L.	<i>Lamiaceae</i>	Anxiety, insomnia, skin conditions.	Diluted oil	Essential oil	Spontaneous
<i>Linum usitatissimum</i> L.	<i>Linaceae</i>	Constipation, cholesterol, inflammation	Decoction	Seeds	Cultivated
<i>Malva sylvestris</i> L.	<i>Malvaceae</i>	Cough, sore throat, inflammation	Infusion	Leaves, flowers	Spontaneous
<i>Marrubium vulgare</i> L.	<i>Lamiaceae</i>	Cough, bronchitis, digestive aid	Infusion, decoction	Aerial parts	Spontaneous
<i>Mentha pulegium</i> L.	<i>Lamiaceae</i>	Digestive problems, menstrual disorders	Infusion	Leaves	Spontaneous
<i>Mentha rotundifolia</i> (L.) Huds.	<i>Lamiaceae</i>	Digestive aid, cold relief	Infusion	Leaves	Spontaneous
<i>Myrtus communis</i> L.	<i>Myrtaceae</i>	Respiratory infections, diarrhea,	Infusion	Leaves, oil	Spontaneous
<i>Nerium oleander</i> L.	<i>Apocynaceae</i>	Skin deases	Infusion	Leaves	Spontaneous
<i>Nigella damascena</i> L.	<i>Ranunculaceae</i>	Digestive and, respiratory issues	Infusion	Seeds	Spontaneous
<i>Olea europaea</i> L.	<i>Oleaceae</i>	Hypertension, cholesterol	Infusion	Leaves, oil	Spontaneous
<i>Oxalis pes-caprae</i> L.	<i>Oxalidaceae</i>	Diuretic, scurvy	Infusion	Leaves	Spontaneous
<i>Pallenis spinosa</i> (L.) Cass.	<i>Asteraceae</i>	Anti-inflammatory, wounds	Infusion	Leaves	Spontaneous
<i>Papaver rhoeas</i> L.	<i>Papaveraceae</i>	Cough, sedation, mild pain relief	Infusion, poultice	Leaves, flowers	Spontaneous
<i>Petroselinum crispum</i> (Mill.) Fuss.	<i>Apiaceae</i>	Diuretic, urinary disorders	Infusion	Leaves, roots	Cultivated and spontaneous
<i>Pistacia lentiscus</i> L.	<i>Anacardiaceae</i>	Gastrointestinal problems, burns	Infusion	Leaves, oil	Spontaneous
<i>Plantago coronopus</i> L.	<i>Plantaginaceae</i>	Cough, wound healing, inflammation	Infusion	Leaves	Spontaneous
<i>Plantago lanceolata</i> L.	<i>Plantaginaceae</i>	Wound healing	Infusion	Leaves	Spontaneous
<i>Polypodium vulgare</i> L.	<i>Polypodiaceae</i>	Cough, liver disorders	Decoction	Rhizome	Spontaneous

Latin Name	Family	Disease treated	Method of preparation	Part used	Status
<i>Populus alba</i> L.	<i>Salicaceae</i>	Anti-inflammatory, analgesic	Infusion	Bark, buds	Spontaneous
<i>Punica granatum</i> L.	<i>Lythraceae</i>	Diarrhea, parasites, antioxydant	Infusion, mastic resin	Peel, bark	Cultivated
<i>Quercus suber</i> L.	<i>Fagaceae</i>	Diarrhea, inflammation	Decoction	Bark	Spontaneous
<i>Rhamnus alaternus</i> L.	<i>Rhamnaceae</i>	Laxative, liver laxative, liver issues	Infusion	Leaves	Spontaneous
<i>Ricinus communis</i> L.	<i>Euphorbiaceae</i>	Constipation, anti-inflammatory	Infusion	Leaves, oil	Spontaneous
<i>Rosmarinus officinalis</i> L.	<i>Lamiaceae</i>	Memory, digestion	Infusion	Leaves, oil	Spontaneous
<i>Rubus ulmifolius</i> Schott.	<i>Rosaceae</i>	Diarrhea, mouth inflammation	Decoction	Leaves, fruits	Spontaneous
<i>Salvia officinalis</i> L.	<i>Lamiaceae</i>	Sore throat, digestion	Infusion	Leaves	Cultivated
<i>Smilax aspera</i> L.	<i>Smilacaceae</i>	Skin diseases, rheumatism	Decoction	Rhizome	Spontaneous
<i>Thapsia garganica</i> L.	<i>Apiaceae</i>	Joint pain (external use)	Infusion	Arial parts (External use only)	Spontaneous
<i>Thymus vulgaris</i> L.	<i>Lamiaceae</i>	Cough, bronchitis, antimicrobial	Infusion	Leaves	Spontaneous
<i>Trigonella foenum-graecum</i> L.	<i>Fabaceae</i>	Diabetes, digestion, lactation	Infusion	Seeds	Cultivated
<i>Urginea maritima</i> (L.) Baker.	<i>Asparagaceae</i>	Heart problems (caution: toxic)	Infusion	Leaves	Spontaneous
<i>Urospermum dalechampii</i> (L.) Scop.	<i>Asteraceae</i>	Digestive aid	Poultice	Flowers	Spontaneous
<i>Urtica dioica</i> L.	<i>Urticaceae</i>	Arthritis, urinary problems, anemia	Infusion	Leaves	Spontaneous
<i>Viola odorata</i> L.	<i>Violaceae</i>	Cough, insomnia, inflammation	Infusion	Flowers, leaves	Spontaneous
<i>Zea mays</i> L.	<i>Poaceae</i>	Urinary tract problems	Infusion	Stigmas, corn	Cultivated
<i>Zingiber officinale</i> Roscoe	<i>Zingiberaceae</i>	Nausea, inflammation, digestion	Infusion	Fresh or dried	Neither cultivated nor spon-taneous, sold on the markets

in human pharmacopoeia, where 75% of medicines originate from plants, and 25% of them contain at least one active molecule of plant origin (Abayomi, 2010). Indeed, the preservation and control of wild flora, as well as its utilization, have become particularly important (Ham-moudi, 2015). The knowledge of the properties and uses of medicinal plants is generally acquired with age and through long experience passed down from one generation to another. The transmission of this knowledge is currently at risk because it is not always ensured.

Various studies have shown that older individuals are the ones who hold the most knowledge and are the most likely to provide reliable information on the virtues and uses of medicinal plants (Derridj et al., 2010; Bout-abia et al., 2011; Bouasla & Bouasla, 2017; Miara et al., 2018; Lazli et al., 2019; Senouci et al., 2019). Indeed, women are the most knowledgeable and most involved in the understanding and use of medicinal plants. As car-egivers responsible for household and children's health, they use medicinal plants more frequently than men.

These findings confirm the results recorded in other eth-nobotanical studies, particularly those of Souilah (2018) and Nouasria (2022), which have shown that women have greater expertise in traditional herbal medicine in Algeria. For the level of education, the same results were reported by other authors (El Hilah et al., 2015; Boughrara&Legseir, 2016; Miara et al., 2018).

In phytotherapy, medicinal plants can be used whole or in parts (leaf, stem, root, bark, fruit) (Senouci et al., 2019). The importance of using leaves compared to other plant parts is due to the ease and speed with which they can be harvested (Kadri et al., 2018). Additionally, leaves play a role in photosynthesis and sometimes in storing secondary metabolites responsible for the plant's biological properties (Bakiri et al., 2016). The high rate of infused herbal teas used to prepare remedies is due to the fact that this method is the easiest and fastest to prepare. Additionally, it is the most suitable method for warming and disinfecting the body, as well as being the oldest and most well-known (Adossides, 2010). These

results are supported by those of (Petkeviciute et al., 2010), in contrast to the findings of (Giday et al., 2003), where most people use medicinal plants in the form of fresh juices.

As demonstrated by various studies, particularly those of (Mikou et al., 2015) and (Lazli et al., 2019), infusion is the most commonly adopted method. It is considered more beneficial and practical (Bouasla & Bouasla, 2017). This preparation method is best suited for delicate plant parts such as leaves, flowers, and flowering tops. In contrast, decoction is recommended for hard and compact plant parts (wood, bark, stems, roots), which release their active compounds only after a relatively long exposure to heat (Lazli et al., 2019).

According to Chevallier (2001), this unusual reliance on traditional medicine is explained by the fact that it offers natural remedies that are well accepted by the body without inducing side effects.

The Lamiaceae family is the most representative in our study region. The dominance of this family was also recorded in other Algerian provinces, notably Adrar and Chlef (Kadri et al., 2018; Maamar sameut et al., 2020), as well as in other neighboring countries such as Morocco (Benkhniue et al., 2011; El Hilah et al., 2015).

Conclusions. The ethnobotanical survey conducted in the two regions, El Hadaiek and Collo

known for their rich floristic and ecological diversity, revealed that the local population possesses extensive knowledge of traditional phytotherapy.

This study allowed us to describe the various medicinal functions of plants as recognized by the local inhabitants. It highlights that all parts of the plants are used for therapeutic purposes.

The local populations of the study area place their trust in traditional medicine for their primary healthcare needs. Therefore, coordinated efforts should be made to integrate traditional medicine practitioners into the healthcare system. However, despite the encouraging results of this ethnobotanical survey, precautions must be considered; it remains inadvisable to use a plant without consulting a specialist.

The valorization of medicinal plants can contribute to increased income, particularly among the rural population, which benefits from certain support projects in Algeria. The findings of this study provide valuable information that can be utilized in various scientific research fields, particularly pharmacology and phytochemistry.

Overall, the results obtained provide scientific justification for the widespread use of medicinal plants and further confirm their importance in the treatment of numerous diseases.

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