

Ethnobotanical survey of medicinal plants used in the management of diabetes and digestive diseases in Biskra region, Algeria.

Samira Fetni ¹, Samir Derouiche ^{2*}, Ammar Ouahab ¹, Nabil Bertella ³

¹ Department of Pharmacy, Faculty of Medical Sciences, University of Batna2, 05000, Algeria

² Laboratory of Biodiversity and Application of Biotechnology in the Agricultural Field, Faculty of Natural Sciences and Life, University of El-Oued, El-Oued 39000, Algeria.

³ Institute of Agronomic and Veterinary Sciences, University of Batna1, 05000, Algeria

* Corresponding author:

Samir Derouiches

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ABSTRACT

This study aims to document and analyze the ethnobotanical knowledge of medicinal plants used by local communities in Biskra, southeastern Algeria. An ethnobotanical survey was conducted between 2017 and 2022 using semi-structured interviews, field observations, and group discussions involving informants from diverse socio-professional backgrounds. A total of 50 plant families were identified, reflecting the rich floristic diversity of the region. The results revealed that leaves were the most commonly used plant part, while infusion was the dominant method of preparation (80%). The recorded plant species were mainly used for treating digestive, anti-inflammatory, and metabolic disorders. Among them, *Ammodaucus leucotrichus* showed the highest usage frequency, particularly for diabetes and hyperlipidemia, followed by *Artemisia herba-alba*, *Rosmarinus officinalis*, and *Nigella sativa*. The findings highlight the strong reliance of local populations on traditional herbal medicine and the importance of preserving this knowledge. This study emphasizes the need for further phytochemical and pharmacological investigations to validate the therapeutic potential of the documented species and to promote their sustainable use.

Keywords: Ethnobotany; Medicinal plants; Biskra; Algeria; Herbal medicine; Phytotherapy

INTRODUCTION

Ethnobotanical knowledge plays a crucial role in preserving traditional healthcare practices, particularly in arid and semi-arid regions where access to modern medicine may be limited ¹. In Algeria, medicinal plants have long been used as primary therapeutic resources, reflecting a rich cultural heritage and deep-rooted knowledge of local flora. The southeastern region, especially Biskra, is recognized for its ecological diversity and unique position at the interface between Mediterranean and Saharan environments, which contributes to a wide variety of plant species with potential medicinal value ².

Despite the importance of traditional medicine, ethnobotanical knowledge is increasingly threatened by modernization, environmental changes, and the loss of indigenous practices ³. Therefore, documenting and analyzing medicinal plant use is essential for biodiversity conservation and the sustainable use of natural resources ⁴. The present study aims to investigate the diversity of medicinal plants used in Biskra, identify their traditional uses, and evaluate patterns of plant part utilization and preparation methods among local communities...

2. MATERIALS AND METHODS

2.1. Study area

The study was conducted in Biskra, a region located in the southeastern part of Algeria, at the northern edge of the Sahara Desert. Biskra lies approximately at 34.85° N latitude and 5.73° E longitude, with an average altitude of about 87 meters above sea level. The region is considered a transitional zone between the Mediterranean climate of northern Algeria and the arid desert climate of the south, making it of significant environmental and agricultural importance (figure 1).

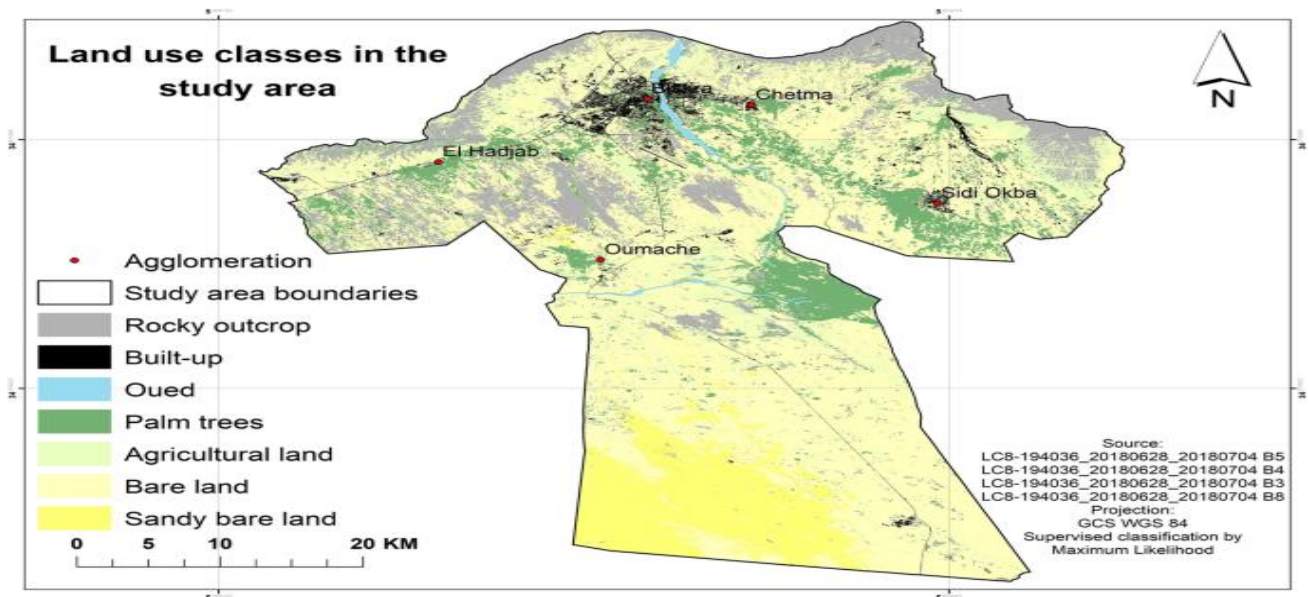


Figure1. Map of the study area region of Biskra Algeria⁵.

The study area includes several agricultural zones and surrounding rural localities within Biskra province. The climate is typically arid, characterized by very hot and dry summers, mild winters, and low, irregular annual rainfall, generally not exceeding 150 mm. Temperature variations are significant, especially between day and night. Water resources are mainly derived from groundwater, which supports irrigation systems essential for agricultural production.

Biskra is recognized as one of the main agricultural hubs in Algeria, particularly known for date palm cultivation, as well as cereals and vegetable crops. Agriculture, along with livestock farming, represents a major source of income for the local population. The region also exhibits notable ecological diversity adapted to arid conditions, contributing to its agricultural productivity

2.2. Data collection

An ethnobotanical survey was conducted to identify and compile a list of plants used in traditional medicine. The present study was conducted during the period 2017–2022 in Biskra, located in southeastern Algeria. Informants from peoples including traditional healers, farmers, herbalists, and housewives, were selected to gather ethnobotanical knowledge related to medicinal plant use followed the methodology ⁷. A total of semi-structured interviews were conducted using open-ended questionnaires, along with field observations and group discussions.

Information was collected in local dialects and later translated into English. Informants were shown fresh plant samples and photographs to confirm plant identity and provide local names. The survey focused on the use of plant species for medicinal, cultural, and therapeutic purposes, including the plant parts used, preparation methods, and modes of administration. To ensure data reliability, the collected information was cross-checked among informants and compared with available literature sources. Plant specimens were collected during field visits and identified using standard taxonomic references. The samples were preserved following conventional herbarium techniques, including drying, labeling, and storage. Scientific names and nomenclature were verified using recognized botanical databases. Ethical considerations were respected throughout the study, and informed consent was obtained from all participants prior to data collection.

To validate the information collected, we cross-checked it with relevant literature sources ^{7,8}. Verbally informed consent was obtained from all informants before conducting the interviews. In addition, for each Indigenous community, we selected a person who was well respected and familiar with the traditions and norms of their respective community to accompany use in the field studies. Throughout the study, we adhered to the Code of Ethics of the International Society of Ethnobiology, available at <https://www.ethnobiology.net>. During our field studies, we collected detailed data on each plant specimen, including relevant taxonomic information. To identify the plants, we consulted the taxonomic literature (<https://eforaindia.bsi.gov.in/eFlora/eFloraHomePage.action>). To preserve the collected plant specimens, we followed convention all herbarium procedures, drying, preserving, labeling, and pasting the mon herbarium sheets. We updated the nomenclature using the taxonomic database Plants of the World Online (POWO) (<https://powo.science.kew.org>).

2.3. Data analysis

The data were summarized in MS Excel, and the analysis was performed using PAST and Origin Prosoftware. To show the relation between medicinal preparation, plant part used, and traditional use categories of plant species.

3. Results

The results of the ethnobotanical survey are summarized in Table 1, with botanical identification revealing 50 plant families. The survey conducted in Biskra, Algeria, indicates that leaves are the most commonly used plant part, while seeds and fruits are favored for their digestive and antioxidant properties. Roots and resins are primarily used for their adaptogenic and healing effects. Infusions are the most common method of administration (80%), followed by decoctions for more resilient plants and local applications for healing plants. *Ammodaucus leucotrichus* stands out, with 31% of participants using it for diabetes, hyperlipidemia and antioxidant properties. Other widely utilized plants include *Artemisia herba-alba* and *Rosmarinus officinalis* for their digestive and anti-inflammatory benefits, and *Nigella sativa* for its immunostimulant properties. The survey underscores the cultural significance of herbal medicine, with an emphasis on digestive and anti-inflammatory treatments, as well as the frequent combination of plants with complementary effects.

Table 1. Ethnobotanical survey result of *Ammodaucus leucotrichus* plant used in Biskra area folk medicine (South-eastern of Algeria).

Scientific name	Local name	Family	Traditional uses	Used part	Mode of administration
<i>Ammodaucus leucotrichus</i>	Kammūn ḥarr	Apiaceae	Antidiabetic, antihyperlipidemic, antioxidant	Fruits	Infusion, decoction
<i>Artemisia herba-alba</i>	Chih	Asteraceae	Antispasmodic, digestive	Leaves	Infusion, fumigation
<i>Marrubium vulgare</i>	Merriwa	Lamiaceae	Expectorant, digestive	Aerial parts	Infusion
<i>Nigella sativa</i>	Habbat al-baraka	Ranunculaceae	Immunostimulant, antimicrobial	Seeds	Powder, infusion
<i>Foeniculum vulgare</i>	Besbes	Apiaceae	Carminative, digestive	Seeds	Infusion
<i>Rosmarinus officinalis</i>	Ikilil	Lamiaceae	Memory booster, anti-inflammatory	Leaves	Infusion, decoction
<i>Thymus vulgaris</i>	Za'atar	Lamiaceae	Antiseptic, expectorant	Leaves	Infusion, decoction
<i>Mentha spicata</i>	Na'na'	Lamiaceae	Digestive, carminative	Leaves	Infusion
<i>Origanum vulgare</i>	Zaatar barri	Lamiaceae	Antibacterial, antifungal	Leaves	Infusion
<i>Citrullus colocynthis</i>	Handhal	Cucurbitaceae	Anthelmintic, purgative	Fruits	Decoction
<i>Ziziphus lotus</i>	Sedra	Rhamnaceae	Antidiabetic, tonic	Leaves, fruits	Infusion, decoction
<i>Peganum harmala</i>	Harmel	Zygophyllaceae	Antispasmodic, vermifuge	Seeds	Fumigation
<i>Phoenix dactylifera</i>	Nakhl	Arecaceae	Laxative, energizer	Fruits	Consumption
<i>Lavandula stoechas</i>	Khozama	Lamiaceae	Sedative, antimicrobial	Flowers	Infusion
<i>Anacyclus</i>	Tigandast	Asteraceae	Aphrodisiac, stimulant	Roots	Infusion

<i>pyrethrum</i>					
<i>Ferula communis</i>	Lfass	Apiaceae	Anthelmintic, antispasmodic	Resin	Decoction
<i>Ruta montana</i>	Fijel	Rutaceae	Antirheumatic, pain relief	Leaves	Poultice
<i>Capparis spinosa</i>	Kabbar	Capparaceae	Antibacterial, diuretic	Buds	Decoction
<i>Pistacia atlantica</i>	Betoum	Anacardiaceae	Gastroprotective, anti-inflammatory	Gum, resin	Chewing, infusion
<i>Haloxylon scoparium</i>	Remth	Amaranthaceae	Diuretic, anti-inflammatory	Leaves	Infusion
<i>Cistus salviifolius</i>	Messoufa	Cistaceae	Anti-inflammatory, cicatrizant	Leaves	Infusion, decoction
<i>Datura stramonium</i>	Datura	Solanaceae	Sedative, pain relief	Leaves, seeds	Decoction
<i>Quercus ilex</i>	Ballout	Fagaceae	Astringent, diarrhea treatment	Bark, acorns	Decoction
<i>Juniperus phoenicea</i>	Araar	Cupressaceae	Respiratory health	Berries	Infusion
<i>Ficus carica</i>	Tine	Moraceae	Digestive, laxative	Fruits	Consumption, infusion
<i>Adiantum capillus-veneris</i>	Dennej	Pteridaceae	Respiratory diseases	Leaves	Infusion, decoction
<i>Vitis vinifera</i>	Karmous	Vitaceae	Antioxidant, cardiovascular health	Fruits	Consumption, infusion
<i>Linum usitatissimum</i>	Zenjalane	Linaceae	Laxative, digestive	Seeds	Infusion, oil
<i>Malva sylvestris</i>	Khoubiza	Malvaceae	Soothing, anti-inflammatory	Leaves	Infusion
<i>Portulaca oleracea</i>	Rigla	Portulacaceae	Diuretic, anti-inflammatory	Leaves	Infusion
<i>Rubia tinctorum</i>	Fouwah	Rubiaceae	Blood purifier, detoxifying	Roots	Decoction
<i>Sideritis incana</i>	Chendgoura	Lamiaceae	Anti-inflammatory, digestive	Aerial parts	Infusion
<i>Euphorbia resinifera</i>	Daghmous	Euphorbiaceae	Healing, antiseptic	Resin	Application
<i>Astragalus gombo</i>	Guermiz	Fabaceae	Immunostimulant, tonic	Roots	Infusion
<i>Colchicum autumnale</i>	Zaghb	Colchicaceae	Gout treatment	Bulbs	Infusion
<i>Lippia citriodora</i>	Louiza	Verbenaceae	Relaxing, digestive	Leaves	Infusion
<i>Ocimum basilicum</i>	H'bak	Lamiaceae	Antispasmodic, digestive	Leaves	Infusion

<i>Salvia officinalis</i>	Mariout	Lamiaceae	Tonic, digestive	Leaves	Infusion
<i>Urtica dioica</i>	H'riga	Urticaceae	Anti-inflammatory, diuretic	Leaves	Infusion, cataplasm
<i>Withania somnifera</i>	Ginseng du désert	Solanaceae	Adaptogen, tonic	Roots	Powder, infusion
<i>Xanthium strumarium</i>	Chorfa	Asteraceae	Diuretic, anti-inflammatory	Leaves	Decoction
<i>Zea mays</i>	Dra el korsî	Poaceae	Renal health, diuretic	Stigmas	Infusion, decoction
<i>Zingiber officinale</i>	Skendri	Zingiberaceae	Digestive, circulatory stimulant	Rhizomes	Infusion
<i>Allium sativum</i>	Touma	Amaryllidaceae	Antimicrobial, cardiovascular health	Bulbs	Infusion
<i>Curcuma longa</i>	Kurkuma	Zingiberaceae	Antioxidant, anti-inflammatory	Rhizomes	Infusion
<i>Cuminum cyminum</i>	Kamoun	Apiaceae	Carminative, digestive	Seeds	Infusion
<i>Carum carvi</i>	Karwiya	Apiaceae	Carminative, digestive	Seeds	Infusion
<i>Trigonella foenum-graecum</i>	Helba	Fabaceae	Anti-diabetic, lactation stimulant	Seeds	Infusion
<i>Anethum graveolens</i>	Chebet	Apiaceae	Digestive, anti-inflammatory	Leaves	Infusion
<i>Coriandrum sativum</i>	Kozbor	Apiaceae	Antiseptic, digestive	Leaves	Infusion

4. Discussion

The results of this study highlight the rich ethnobotanical diversity of Biskra, with a wide range of plant species belonging to multiple families used in traditional medicine. The dominance of certain families such as *Lamiaceae* and *Apiaceae* is consistent with previous ethnobotanical studies conducted in arid and semi-arid regions, where these families are known for their high content of bioactive compounds⁹.

Leaves were identified as the most commonly used plant part, which may be attributed to their accessibility, ease of harvesting, and high concentration of secondary metabolites. The frequent use of infusions as the primary mode of preparation (approximately 80%) reflects a simple and effective method of extracting active compounds, widely practiced in traditional medicine¹⁰.

The prominence of species such as *Ammodaucus leucotrichus*, *Artemisia herba-alba*, and *Nigella sativa* indicates their significant therapeutic value among local populations. For instance, the high usage rate of *Ammodaucus leucotrichus* for metabolic disorders such as diabetes and hyperlipidemia suggests strong local confidence in its medicinal properties¹¹. Similarly, the widespread use of aromatic plants like *Rosmarinus officinalis* and *Thymus vulgaris* highlights their importance in treating digestive and inflammatory conditions¹².

The study also reveals a strong cultural reliance on herbal medicine, particularly for digestive and anti-inflammatory treatments. The combination of different plant species for synergistic effects further demonstrates the complexity and sophistication of traditional knowledge systems. These findings are in agreement with earlier studies, confirming the continued relevance of medicinal plants in primary healthcare systems in Algeria and similar environments¹³.

5. Conclusion

This study provides valuable insights into the diversity and traditional use of medicinal plants in Biskra, Algeria. The findings demonstrate a strong dependence on plant-based remedies, with a wide variety of species used for treating multiple health conditions, particularly digestive and inflammatory disorders. The predominance of leaves and infusion methods highlights practical and sustainable aspects of traditional plant use. However, the ongoing loss of ethnobotanical knowledge underscores the urgent need for documentation and conservation efforts. Future research should focus on the phytochemical and

pharmacological validation of the most frequently used species to support their integration into modern medicine and ensure their sustainable utilization.

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