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

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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 value2.

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 resources4. 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 Ahgeria, 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).

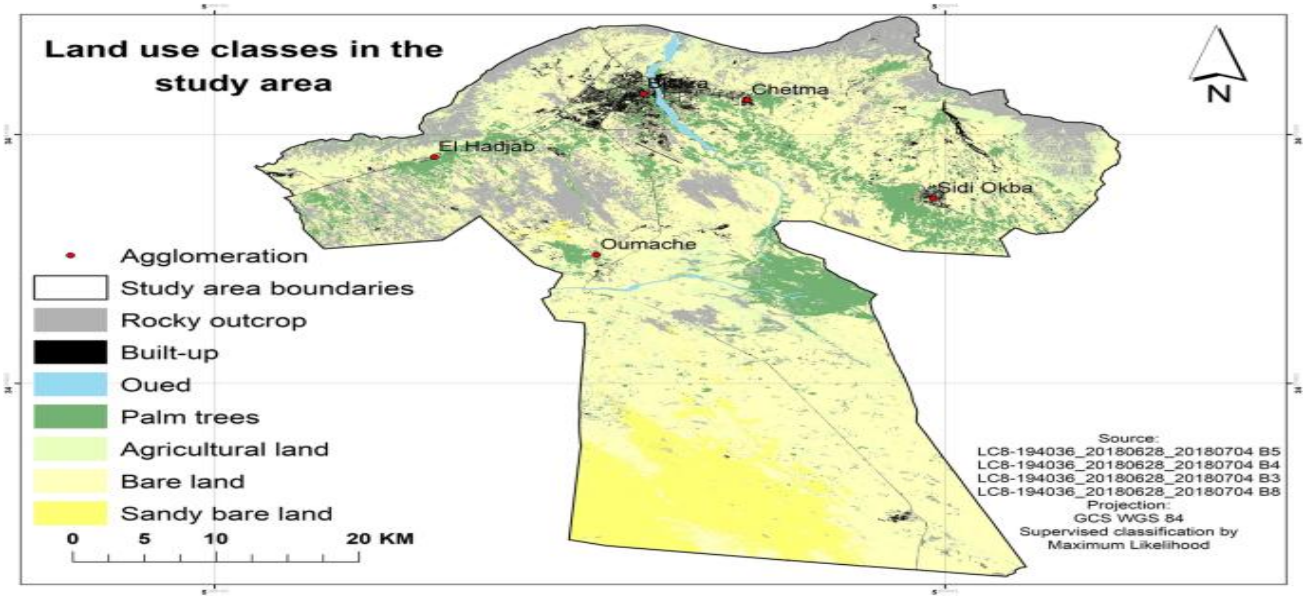

Figure1. Map of the study area region of Biskra Algeria[5].

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

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

Salvia officinalis	Mariout	Lamiaceae	Tonic, digestive	Leaves	Infusion
Urtica dioica	H'riga	Urticaceae	Anti-inflammatory, diuretic	Leaves	Infusion, cataplasm
Withania somnifera	Ginseng du désert	Solanaceae	Adaptogen, tonic	Roots	Powder, infusion
Xanthium strumarium	Chorfa	Asteraceae	Diuretic, anti-inflammatory	Leaves	Decoction
Zea mays	Dra el korsi	Poaceae	Renal health, diuretic	Stigmas	Infusion, decoction
Zingiber officinale	Skendri	Zingiberaceae	Digestive, circulatory stimulant	Rhizomes	Infusion
Allium sativum	Touma	Amaryllidaceae	Antimicrobial, cardiovascular health	Bulbs	Infusion
Curcuma longa	Kurkuma	Zingiberaceae	Antioxidant, anti-inflammatory	Rhizomes	Infusion
Cuminum cyminum	Kamoun	Apiaceae	Carminative, digestive	Seeds	Infusion
Carum carvi	Karwiya	Apiaceae	Carminative, digestive	Seeds	Infusion
Trigonella foenum-graecum	Helba	Fabaceae	Anti-diabetic, lactation stimulant	Seeds	Infusion
Anethum graveolens	Chebet	Apiaceae	Digestive, anti-inflammatory	Leaves	Infusion
Coriandrum sativum	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 compounds[9].

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 medicine[10].

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 properties[11]. Similarly, the widespread use of aromatic plants like *Rosmarinus officinalis* and *Thymus vulgaris* highlights their importance in treating digestive and inflammatory conditions[12].

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 environments[13].

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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